University of Alberta

# Measurement and Conceptual Issues Regarding the Assessment of Situational Threat and Competitive Trait Anxiety in Ice Hockey

by

John G. H. Dunn ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Faculty of Physical Education and Recreation

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# Abstract

The purpose of this dissertation was to illustrate a number of limitations in sport psychology research regarding the measurement and conceptualisation of situational threat and competitive trait anxiety (CTA). Study 1 was conducted to show how research in sport psychology can be enhanced by combining nomothetic and idiographic procedures, and to highlight that this combined approach provides researchers with opportunities to validate nomothetic principles at the individual level, while simultaneously generating nomothetic hypotheses from idiographic analyses. To illustrate these points, a nomothetic profile of situational threat perceptions based upon the responses of 46 ice hockey players reported by Dunn and Nielsen (1993) was compared against the perceptual profiles of three individual players. The comparisons showed many unique perceptual differences between the group and individual solutions. Results also revealed that athletes recognise a variety of situational threats within the sport of ice hockey. Study 2 examined the extent to which 178 intercollegiate ice hockey players were predisposed to worrying about some of the situational threats identified in Study 1. Specifically, Study 2 employed a multidimensional conceptualisation of situational CTA, and investigated whether four A-trait dimensions proposed, in part, by Endler (1983), provided a valid framework for assessing cognitive CTA in ice hockey. A multi-method multi-analytic design revealed four cognitive CTA dimensions that were congruent with the physical danger anxiety, performance failure anxiety, negative social evaluation anxiety, and situational uncertainty anxiety dimensions proposed by Endler (1983). Having established that individual differences in situational worry tendencies exist, individual athlete-worry profiles were used to highlight the limitations of relying solely on the Sport Competition Anxiety Test (SCAT: Martens, 1977) and Sport Anxiety Scale (SAS: Smith, Smoll, & Schutz, 1990) as measures of CTA. It is argued that the SCAT and SAS assess athletes' proneness for anxiety to "sport in general," but provide little information about why athletes experience this anxiety since neither instrument gives consideration to the existence of different situational threats that might reside within the competitive sport environment. Recommendations to extend the scope (i.e., coverage) of the nomological network surrounding cognitive CTA theory are proposed.

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# CHAPTER 1

## Introduction

May (1977) depicts the twentieth century as the "age of anxiety"—a term that seems appropriate for describing the field of modern-day sport psychology where the study of anxiety has received considerable attention over the last 20 years (Spielberger, 1989). The sustained research focus on anxiety in sport has been driven, to a large extent, by the need of sport practitioners to better understand anxiety and its effects upon athletic performance (Schilling & Apitzsch, 1989). Because research has consistently shown that certain levels of heightened anxiety can be detrimental to motor performance (Burton, 1988; Landers, 1980; Neiss, 1988), a greater understanding of the symptoms, antecedents, and consequences of competitive anxiety is needed. Further knowledge in this area will enable coaches and sport psychologists to better assist athletes in their efforts to achieve optimal levels of performance (Martens, Vealey, & Burton, 1990).

The term stress has frequently been used interchangeably with the term anxiety in the sport psychology literature (Gould & Krane, 1992). Throughout this dissertation, however, Spielberger's (1972b, 1985, 1989) use of the terms stress and anxiety has been adopted. Spielberger (1972b) proposed that the term stress be used to describe a process in which an individual encounters a stressful situation (i.e., stressor) that is perceived as threatening or dangerous. If a threat to the individual's psychological or physical well-being is perceived, the person is likely to experience the unpleasant, and often destructive, emotional response termed state anxiety (A-state).[1] State anxiety is defined by Spielberger (1972a) as the momentary "unpleasant consciously perceived feelings of tension and apprehension, with associated activation or arousal of the autonomic nervous system" (p. 29). Notwithstanding this general definition, individual differences are virtually always present in the types of behavioural and emotional reactions that are evoked when various stressful situations are encountered (Lazarus & Folkman, 1984). If these individual differences are to be fully understood, a more detailed examination of the factors affecting the stress process is required.

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[1] Some researchers (e.g., Lazarus & Folkman, 1984; Tomaka, Blaskovich, Kelsey, & Leitten, 1993) propose that the term threat be used to describe the appraisal that occurs before, or in anticipation of, encountering a stressor. However, for the purpose of this dissertation, the term threat will be used to describe the nature and characteristics of a competitive stressor that evokes the perception of psychological or physical danger, irrespective of whether the perceived danger is judged by the athlete to have occurred in anticipation of, or as a consequence of, encountering the stressor.

Threatening situations or stressors can be examined in terms of either their objective features or their psychological features. Objective features describe the situation "as it is" (Magnusson, 1981, p. 3), whereas psychological features describe the situation "as it is perceived" (Magnusson, 1981, p. 3). The differences between objective and psychological characteristics of stressors in a sport context are illustrated by two studies conducted by Dunn and Nielsen (1993, 1996). Dunn and Nielsen (1996) developed an "objective" between-sport classificatory system of anxiety-inducing situations from four similarly structured team sports (basketball, field hockey, soccer, and ice hockey). A list of 821 game situations associated with heightened competitive anxiety were generated by 185 athletes. On the basis of their most salient objective features, an inductive content analysis was used to classify the situations into 16 homogeneous categories. These categories accommodated situational features relating to offense, defense, injury, opponents, coaches, and game/score criticality. Although this classification system provided a starting point from which situational factors affecting competitive state anxiety could be examined, Dunn and Nielsen (1996) acknowledged that the objective situational classificatory system was not sufficient, in and of itself, to explain why anxiety was experienced. To address this concern, Dunn and Nielsen (1993) examined how athletes from the sports of ice hockey and soccer perceived the psychological characteristics of many of the same anxiety-inducing situations cited in the 1996 study. Results of a group-level multidimensional scaling (MDS) analysis revealed that athletes perceived situations based upon their capacity to evoke threats regarding fear of failure, ego threat, fear of physical harm, fear of being embarrassed by the coach, and the fear of being unable to control a situation.

Because numerous researchers have cautioned that different individuals may not attach the same psychological meaning to the same situation (e.g., Fisher & Zwart, 1982;

Klirs & Revelle, 1986; Pargman, 1993), a limitation of Dunn and Nielsen's (1993) study of situational threat perceptions is that the findings are based upon a group-perception MDS solution. That is, the group-perception solution reflects how athletes, on average, perceived the nature of situational threat in hockey and soccer, but may not accurately represent individual athletes' threat perceptions. Therefore, the first study of this dissertation was conducted to investigate the generalizability of the group perception profile provided by Dunn and Nielsen (1993) and to illustrate how researchers, faced with the difficult decision of whether to assess the psychological situation from a nomothetic or an idiographic perspective (Edwards, 1984), can effectively use both approaches.

The perception of situational threat is central to Spielberger's (1972b) stress process. When a person perceives a situation to be threatening to his or her psychological or physical well-being, the individual becomes motivated to avoid the threat (Smith & Lazarus, 1990). Potential behaviours that may reduce the amount of threat present in the situation can range from a direct "attack" at the source of the threat to "fleeing the situation" in which the threat is present (Smith & Lazarus, 1990, p. 615). From an information-processing perspective, if an individual appraises a situation as threatening, while simultaneously perceiving that he or she does not possess the ability to cope with the demands of the threatening stimulus (Lazarus & Folkman, 1984), then maximal elevations in anxiety are likely to occur. It is important to note, however, that irrespective of whether a danger actually exists, every individual's reality is shaped by his or her own perceptions of the world. This "phenomenological reality" (cf. Hergenhahn, 1990, p. 437) will, in turn, be the primary determinant of a person's behaviour. For example, a young gymnast who fears being hurt on landing prior to his or her first attempt at vaulting into a padded "landing pit" may refuse to jump although there is almost no objective physical danger present in the activity. In other words, anxiety motivates the gymnast to avoid confronting the perceived threat (i.e., physical danger). In contrast, a young child who is not aware (i.e., fails to perceive) that a hot kettle (i.e., stressor) can burn (i.e., threat of physical danger), may unwittingly touch the kettle because he or she has no previous experience with the potential danger inherent in the situation.

The two examples in the preceding paragraph demonstrate that perceptions of threat can be based upon either the immediate informational input that an individual is capable of processing, or upon previous encounters with similar situations (Higgins, 1990). In addition to these factors, a key person-characteristic that can influence a person's perception of threat is trait anxiety (A-trait). According to Spielberger (1985), A-trait reflects relatively stable individual differences "in the tendency to perceive stressful situations as dangerous or threatening, and in the disposition to respond to such situations with more or less intense elevations in [state] anxiety" (p. 10). In other words, individuals high in A-trait are more likely to perceive a variety of situations as threatening and to respond with larger increases in A-state than persons low in A-trait.

Taylor (1953) is credited with developing the first psychometrically sound A-trait inventory—the Taylor Manifest Anxiety Scale (TMAS). Despite its popularity and significant contribution to anxiety research in the 1950s (Spielberger, 1985), researchers observed that individuals' scores on the TMAS did not always predict their A-state responses across different situations. That is, different levels of A-state were experienced by the same individual when confronted by different types of situations. Given these findings, researchers questioned the existence of a general A-trait construct and different situational classes of A-trait were proposed (e.g., test anxiety; pubic speaking anxiety). Among these newly developed situation-specific classes of A-trait was competitive trait anxiety (CTA)—defined as a person's "tendency to perceive competitive situations as threatening and to respond to these situations with A-state" (Martens et al., 1990, p. 11). Martens (1977) developed the Sport Competition Anxiety Test (SCAT) to measure CTA, and the instrument has since become the most frequently used measure of CTA in the sport psychology literature (Gould & Krane, 1992).

In accordance with Spielberger's (1985) predictions regarding the effects of A-trait, competitive trait anxiety research using the SCAT has shown that high CTA athletes, on average, worry more frequently about aspects of competition relating to potential failure and negative social evaluation (e.g., Passer, 1983; Rainey & Cunningham, 1988), experience higher levels of pre-competition A-state (e.g., Martens &

Simon, 1976), and perform significantly poorer (e.g., Weinberg & Genuchi, 1980) than their low CTA counterparts. Notwithstanding the SCAT's popularity and important contribution to CTA research, Kroll (1980) commented that the instrument provides very little information about why athletes experience anxiety. Moreover, Fisher and Zwart (1982) suggested that the SCAT may not be sensitive to different types of situational threats that can exist in competitive sport environments. Recognising that individual differences exist in the tendency to experience anxiety in response to different types of threatening situations, Endler (1983) and his colleagues (e.g., Endler, Edwards, & Vitelli, 1991; Endler, Edwards, Vitelli, & Parker, 1989; Endler & Okada, 1975) proposed four situational A-trait dimensions: social evaluation A-trait, ambiguous/uncertainty A-trait, physical danger A-trait, and daily routines A-trait. However, with the exception of Hackfort (1986; Hackfort & Schwenkmezger, 1993), these (and other similar) situational A-trait dimensions have been afforded little attention in the sport psychology literature. This is surprising given that research has found a variety of situational threats in competitive sport (e.g., Dunn & Nielsen, 1993, 1996). Consequently, the main purpose of the second study in this dissertation was to assess the viability of incorporating some of the situational A-trait dimensions proposed by Endler (1983) and Hackfort (1986) into the current nomological framework surrounding CTA theory.

The focus of the second study is on a key component of anxiety: namely, cognitive-worry (Cattell & Scheier, 1961; Liebert & Morris, 1967). In the sport anxiety literature, cognitive A-state is often associated with "negative expectations about performance and...negative self-evaluation[s]" (Martens, Burton, Vealey, Bump, & Smith, 1990, p. 120); these negative evaluations frequently manifest themselves in the form of excessive worry. The key assumptions in this dissertation regarding worry are that it is future oriented (i.e., it occurs in anticipation of potential negative consequences that may result from an encounter with a stressor), it generates negative affect, and it is a mental state that, if given a choice, individuals would rather avoid (Borkovec, 1994;

Borkovec et al., 1983; Eysenck & van Berkum, 1992; Tallis, Davey, & Capuzzo, 1994).[2] The framework for the operational definition of worry employed in Study 2 was provided by Borkovec, Robinson, Pruzinsky, and DePree (1983) who define worry as:

> a chain of thoughts and images, negatively affect laden and relatively uncontrollable. The worry process represents an attempt to engage in mental problem solving on an issue whose outcome is uncertain but contains the possibility of one or more negative consequences. Consequently, worry relates closely to the fear process. (p. 10)

Although some psychologists do not make any distinction between the terms fear and anxiety, Lazarus (1991) asserts that the two emotions (if they are indeed separate) are characterised by different threatening circumstances and should be treated separately. However, fear and anxiety are both recognised as serving similar motivational functions—to help individuals prepare for, cope with, or escape from, an impending stressor. Accordingly, given the similar motivational functions that fear and anxiety serve, the term fear is used in Study 2 to describe an athlete's cognitive aversion towards specific threatening situations which, in turn, is assumed to reflect the athlete's need or desire to avoid the negative consequences associated with the stressor. Although not defined specifically in this way, this usage of the term fear is similar to other referents in the sport anxiety literature (cf. Gould, Horn, & Spreeman, 1983; Hackfort & Schwenkmezger, 1989, 1993; Martens et al., 1990; Passer, 1983; Rainey & Cunningham, 1988).

It is important to emphasise that the focus of Study 2 is on the cognitive aspect of CTA as opposed to the somatic aspect of anxiety—a person's "perceptions of bodily symptoms of autonomic reactivity characterised [for example] by butterflies in the stomach, racing heart, and shakiness" (Krane, 1992, p. 74). The distinction between cognitive and somatic anxiety is important since research in the competitive sport domain has shown that each component has different antecedents and can differentially affect motor performance. For example, Burton (1988) found a significant negative relationship between cognitive anxiety and swimming performance among 28 intercollegiate athletes, while the relationship between swimming performance and somatic A-state was characterised by an inverted-U relationship (cf. Yerkes & Dodson, 1908). Similarly, Gould, Petlichkoff, Simons, and Vevera (1987) found an inverted-U relationship between somatic A-state and pistol shooting performance among 39 trainee police officers, although no relationship was found between cognitive A-state and shooting performance.

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[2] Although the act of worrying may provide benefits to the individual, since worrying may act as a problem-solving activity that is used to devise coping strategies for dealing with a stressor (Tallis et al., 1994), investigating the potential benefits of worry is beyond the scope of this dissertation.

Bird and Horn (1990) examined the effect of both cognitive and somatic A-state on performance errors committed during competition by 161 female high school softball players. Results showed that athletes who committed a large number of mental errors (defined as, "the degree to which each player's performance was adversely affected during a particular game as compared with her usual performance during practice" [p. 219]) had significantly higher levels of cognitive A-state than athletes who committed few errors. In contrast, somatic anxiety was not related to mental errors during competition. Cognitive and somatic A-state reactions among female university ($\underline{N} = 11$) softball players were also examined recently by Krane, Joyce, and Rafeld (1994). Results showed that players experienced significantly higher levels of cognitive A-state in "high criticality" batting situations (e.g., bringing home a player from third base late in a tied game) as compared to "low criticality" batting situations (e.g., batting in the early innings when the team is already winning by more than two runs), while no differences were found in athletes' somatic A-state reactions between high and low criticality situations. From an applied perspective, the results of these studies demonstrate the need to distinguish between the two components of competitive anxiety. Specifically, if intervention programs are to be designed to help athletes deal with anxiety before or during competition, then the treatment programs should be targeted at the appropriate anxiety dimension (Smith, Smoll, & Schutz, 1990). For instance, the findings obtained by Bird and Horn (1990) suggest that there is little utility in helping female high school softball players address their somatic complaints if cognitive anxiety is the primary component affecting performance. Further implications for the development and application of psychological skills programs are discussed on the basis of results in Study 2.

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# CHAPTER 2

## Toward the Combined Use of Nomothetic and Idiographic Methodologies in Sport Psychology: An Empirical Example[1]

The search for universal laws has traditionally been viewed as one of the major goals of scientific research (Allport, 1937; Palys, 1992). To this end, nomothetic research (as opposed to idiographic research) has generally been considered the most compatible method for dealing with the aims of "orthodox science" (Martens, 1987, p. 31). The term nomothetic was adopted by Allport (1937) from the German philosopher Windelband, and is derived from the Greek word nomos, meaning "custom or law" (Jaccard & Dittus, 1990, p. 312). Nomothetic research attempts to establish universal laws or generalizations about the phenomena under investigation, and although Windelband originally intended the term nomothetic to apply to that which always is, Lamiell (1991) contends that the literature has tended to use the notion of generality to apply to that which is true in the aggregate. In contrast, the term idiographic comes from the Greek word idios, which means "proper to one" (Jaccard & Dittus, 1990, p. 312), and is generally used to describe methods that involve the intensive study of the individual (Pervin, 1984).[2]

Unfortunately, the nomothetic and idiographic approaches have traditionally been viewed as antithetical. Researchers have tended to advocate one approach, thereby failing to take advantage of the unique knowledge that the other can offer. However, dismissing an alternative methodology, or refusing to acknowledge another point of view is dogmatic and ultimately hurts the advancement of sport psychology (Strean & Roberts, 1992).

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[1] A version of this chapter has been published. Dunn 1994. The Sport Psychologist. 8: 376-392.

[2] Lamiell (1995) suggests that the term nomothetic, in the Windelbandian sense, referred to something that was "recurrent across persons" (p. 161) whereby a nomothetic law "could only come from a series of N = 1 studies...[where the] putative law...[held] up across individual persons" (Lamiell, 1995, p. 161). In other words, Windelband's notion of nomothetic regularity was predicated upon analyses at the individual level (Bouffard, 1997). Bouffard (1997) points out that recently, the scientific community has tended to use the term nomothetic in reference to research methods (e.g., correlational and individual differences designs) that generate knowledge from the study of aggregate data; given this modern use of the term, nomothetic generalisations relate to the average person within a group, and not necessarily to any specific individual. Unless stated otherwise, this latter use of the term nomothetic is adopted throughout the paper.

Due to the concern that social psychologists have had for presenting their work as scientific (Strean & Roberts, 1992), nomothetic procedures have dominated research in the behavioural sciences (Cronbach, 1975; Howard & Myers, 1990) and, more specifically, in sport psychology (Martens, 1987; Vealey, 1992). In fact, some researchers (e.g., Nunnally, 1967) have even viewed the idiographic approach as antiscientific, and as a result, analysis at the individual level has received relatively little attention. Recently, however, many researchers in sport psychology have recommended that a greater emphasis be placed upon the use of idiographic techniques (e.g., Gould & Krane, 1992; Hackfort & Schwenkmezger, 1989; Martens, 1987; Seiler, 1992; Smith, 1989; Strean & Roberts, 1992; Vanden Auweele, De Cuyper, Van Mele, & Rzewnicki, 1993; Vealey, 1992; Weinberg, 1989).

A number of prominent social psychologists have long recognised the value of idiographic investigation as a means of assessing whether nomothetic principles apply at the individual level (e.g., Allport, 1962; Beck, 1953). Frank (1986) warned that, "nomothetic science can never escape the individual, because its findings must [eventually] be applied to the individual" (p. 24). In other words, the extent to which general principles and laws (as defined by Windelband) are beneficial depends largely upon the degree to which they can provide an understanding at the individual level (Martens, 1987; Skinner, 1953). To this end, the idiographic validation of nomothetic principles (Harris, 1980) appears not only to be warranted, but is, in fact, a necessity if a better understanding of an individual's behaviour is to be acquired. Furthermore, idiographic investigations can be used to delineate new variables and generate working hypotheses that can be tested at the group level (Falk, 1956; Pervin, 1984). In conclusion, a greater understanding of the phenomena being studied in sport psychology is more likely to be obtained if investigators "report both idiographic and nomothetic findings" (Eklund, Gould, & Jackson, 1993, p. 46) from the same study.

Notwithstanding recent recommendations for the combined use of nomothetic and idiographic procedures (Hermans, 1988; Krahé 1992; Lippa & Donaldson, 1990; Pelham, 1993; Vealey, 1992), few studies in sport psychology have actually utilised the two approaches simultaneously. The area of competitive-anxiety has been no exception, with most research being conducted within a nomothetic framework. For example, a number of investigations into athletes' threat perceptions in competitive anxiety-inducing situations have been conducted (e.g., Dunn & Nielsen, 1993; Fisher & Zwart, 1982; Gould, Horn, & Spreeman, 1983), and although different sports and populations have been studied, the psychological constructs associated with competitive threat (e.g., fear of failure, ego threat, fear of physical harm, degree of personal control, consequential and anticipatory threat) have generally been based on group-level analytical procedures (e.g., factor analysis, multidimensional scaling). These analytical techniques combine or aggregate data across subjects to extract the factors or dimensions that are then assumed to reflect the psychological constructs underlying subjects' perceptions.

However, Silva (1984) raised a concern about the inferences made from such analyses, stating that, "when psychological measures are averaged across individuals, a mean or average personality is often reported [which] may not represent any athlete in the sample" (p. 65). Similarly, Allport (1937, 1962) criticised the psychological community for studying the "generalized mind" which, he contended, is a mythical concept that in reality does not exist. As a result of these concerns, a number of researchers (e.g., Bouffard, 1993; Hackfort & Spielberger, 1989; Martens, 1987) have questioned the validity of inferences drawn from some group-level analyses when applied at the individual level.

The primary purpose of this paper was to show the utility of combining nomothetic (i.e., data aggregation) and idiographic methodologies within a single research paradigm. This combined approach allows the researcher to assess the degree to which nomothetic (i.e., aggregate-level) inferences are valid when applied to the individual, while simultaneously permitting the researcher to determine the extent to which seemingly unique individual characteristics are actually present among other group members. The study compares a nomothetic group profile of situational threat perceptions based upon the responses of 46 ice hockey players (Dunn & Nielsen, 1993) with the perceptual profiles of three individual hockey players from the same sample. The nomothetic results discussed in this paper have been previously reported by Dunn and Nielsen (1993) and, therefore, are only briefly described here. The reader is referred to Dunn and Nielsen (1993) for a more comprehensive discussion of the nomothetic procedures and results.

Dunn and Nielsen (1993) examined the perceptions of situational threat among 46 male varsity ice hockey players (mean age, 22.3 years) from two teams. The authors developed the following inventory of 15 situations chosen from 244 ice hockey anxiety-inducing game situations in a previously established taxonomy of athlete-generated responses (Dunn & Nielsen, 1991):

1. The referee makes an error on the call. You receive a 2 minute penalty.
2. You commit an undisciplined penalty. During the powerplay the opposition scores.
3. You are benched by the coach following several unforced errors.
4. The coach openly criticises you in full view of team mates and spectators.
5. You are caught up-ice and an opponent gets an offensive breakaway.
6. The coach requests that you take a crucial defensive face-off.
7. You are about to take a crucial penalty shot.
8. You have just missed a crucial penalty shot.
9. You are chasing the puck into the corner and cannot avoid the check from behind.
10. You must go down and block a slap shot with your body to prevent a shot on goal.
11. You give up a bad pass in your own end and as a result the opposition scores.
12. You lose the opponent you were checking in your defensive end.
13. You are about to go onto the ice to kill the last minute of a crucial penalty.
14. You miss an excellent scoring opportunity by giving the goaltender an easy save.
15. Late in a tied game you get an offensive breakaway with only the goaltender to beat.

Subjects of Dunn and Nielsen's (1993) study were asked to rate the degree of perceived similarity of threat perceptions (i.e., why was threat experienced) across all possible pairs of the 15 selected stimuli (i.e., situation descriptors). A group-level multidimensional scaling (MDS) analysis was used to determine the psychological constructs upon which hockey players based their perceptions of threat. The MDS analysis was used to produce a geometric configuration of the data points (based upon the Euclidean distances between the points) that best represented the latent psychological structure of the data in an $\underline{n}$-dimensional space (Kruskal & Wish, 1978). The psychological constructs underlying the data were then established by interpreting (a) the dimensions that encompassed the data points (i.e., situations) and (b) the clusters into which the data points fell. The cognitive profile of the hockey players was represented by the three-dimensional group solution ($\underline{R}^2 = .30$, stress = .27) shown in Figure 2-1. Within the three-dimensional space, the circles provide the location of each stimulus (i.e., situation), while the vertical lines drawn from the stimuli provide their reference point on the bottom plane. The numbers accompanying each situation correspond to the abbreviated situation descriptions listed previously.

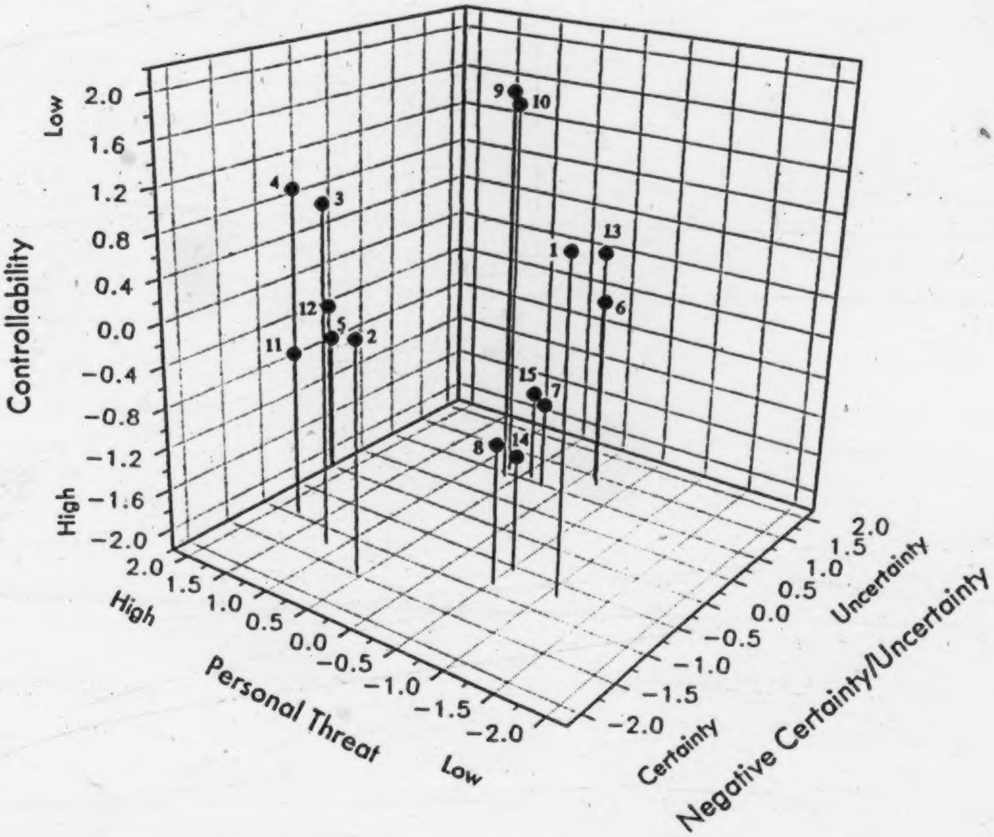

Figure 2-1. Three-dimensional INDSCAL group solution. From "A Between-Sport Comparison of Situational Threat Perceptions in Ice Hockey and Soccer" by J. G. H. Dunn and A. B. Nielsen, 1993, Journal of Sport & Exercise Psychology, 15, p. 454.

In interpreting the dimensions, Dunn and Nielsen (1993) labelled Dimension 1 "negative certainty/uncertainty." Figure 2-1 reveals that the situations were arranged along the dimension according to whether a negative outcome had occurred or whether the potential for a negative outcome still existed. The situations were arranged along the second dimension according to the degree of "personal threat" or "ego threat" (Fisher & Zwart, 1982) that each situation posed for the athletes. The third and final dimension was interpreted as a continuum of "controllability" and reflected the perceived amount of personal control the athletes assumed in each situation.

Decisions concerning the cluster membership of situations were based upon the interpretability of the clusters, and upon the relative between-point distances of the situations both within and between clusters. The underlying psychological constructs associated with threat in the clusters shown in Figure 2-1 were labelled "physical harm" (Situation 9 = chase puck into corner, Situation 10 = block slap shot with body), "uncontrollable coach-related threat" (Situation 3 = benched by coach, Situation 4 = receive criticism), "fear of failure" (Situation 6 = about to take crucial face-off, Situation 7 = about to take penalty shot, Situation 13 = about to kill a penalty, Situation 15 = offensive breakaway), "negative outcome certainty" (Situation 2 = undisciplined penalty, Situation 8 = missed penalty shot, Situation 11 = bad pass gives up goal, Situation 14 = missed good scoring opportunity), and "unknown consequence" (Situation 5 = caught up-ice, Situation 12 = lost defensive check). The latter cluster received the label "unknown consequence" because errors have been committed by the athletes in both situations, but the final consequence or significance of their actions is not yet known.

Dunn and Nielsen (1993) did not discuss the characteristics of Situation 1 (referee error) during their analysis of cluster characteristics. However, based on the relative isolation of Situation 1 from other points in the solution, the situation probably possesses characteristics that are not inherent in any of the other situations. When the referee makes a critical error, not only is the athlete entirely powerless to influence the referee's decision, but no infraction of the rules has actually been committed. Therefore, threat is likely perceived as a result of the athlete feeling "frustrated" or "helpless."

Although highly interpretable psychological constructs were obtained from the group solution, only 30% of the total variance was accounted for. As the correlation coefficient (R) deviates from an absolute value of 1.0, the degree to which generalizations can be made to individuals within the group, and to individuals within the population represented by the sample, decreases (Brody, 1988; Lamiell, 1981). The moderate $R^2$ value obtained for the group solution indicated that perceptual differences probably existed among the athletes. Furthermore, Ashby, Maddox, and Lee (1994) have recently argued that even good fitting MDS solutions which are based upon averaged data "cannot be taken as [conclusive] evidence that the model describes the psychological structure that characterises individual subjects" (p. 144). Therefore, the combined use of nomothetic and idiographic procedures in this study allows the researcher to test how well the nomothetic group solution actually represents the psychological profiles of individual athletes. The results of the individual analyses can then be used to generate hypotheses that can be tested at the group level to see if Windelbandian nomothetic regularities exist.

## Method

### Participants

To test the degree to which the nomothetic aggregate-type generalizations were valid at the individual level, one winger (age = 21.5 years), one center (age = 22.9 years), and one defenseman (age = 22.2 years) from Dunn and Nielsen's (1993) original sample (Canadian varsity athletes playing on two nationally ranked top 10 teams) volunteered to be assessed idiographically during the off-season, 4 months after the group data had been obtained. The athletes were chosen because their ages were all within one standard deviation of the average age of the original sample and all were regular starters on their team. A brief description of each athlete's personal characteristics is provided.

Winger. The winger was an assistant captain, and perceived that his major role on the team was to "lead by example and score goals." He finished the season as one of the team's top three point and goal scorers. He was considered by the coaching staff to be one of the fastest skaters on his team and was, therefore, used on both the powerplay and penalty-killing units.

Center-Ice. The center perceived himself to be one of the team's play makers. The coaching staff identified him as a very consistent player who could always be relied on to make "smart plays." Although he was ranked among the top 6 point scorers on the team, he was not renowned for his goal scoring ability. He was regularly assigned the job of taking important face-offs in both the offensive and defensive zones. The center cited his lack of speed on the ice to be his biggest playing weakness.

Defenseman. The defenseman provided the team with a hard-checking physical presence. He was one of the biggest players on the team and believed that his major playing duty was simply to play "strong defense and stop the opposition from scoring goals." He was considered one of the top penalty-killing defenseman on the team. He felt that his biggest playing weakness was his shooting ability because he scored fewer goals than most of his fellow defenseman who saw the same amount of playing time.

## Instrument

The inventory used by Dunn and Nielsen (1993) was again used in the present study. The inventory consisted of a category rating technique (Davison, 1983) that required subjects to rate the degree of perceived similarity of threat perceptions (i.e., why was threat experienced) across 15 game situations. The situations were presented to the subjects in pairs, so that a similarity rating could be made for every possible combination of situation pairings; a total of 105 paired comparisons were made. Subjects were instructed to rate each pair of situations according to how similar they perceived the "reason for anxiety" to be in each situation. The ratings were done along a 9-point Likert-type scale ranging from zero (not at all similar) to eight (very similar). For example, if an athlete felt threatened because he feared being injured in Situations 9 (chase puck into the corner while pressured) and 10 (block slap shot with body), a similarity rating of 8 (very similar) would have been assigned on this paired comparison. Ross ordering (Ross, 1934) of the stimuli was employed throughout the inventory to minimise any potential presentation order effects (Davison, 1983).

## Procedures

Each athlete completed the inventory twice, with a 7 day period between testing sessions. Having the athletes complete the inventory on two separate occasions reduced the potential deleterious effects that random measurement error (possibly caused by athletes accidentally checking the wrong portion of the scale) could have had upon the solutions obtained from a single testing session. In addition, the test-retest format enables the researcher to assess, at least to some extent, the reliability (i.e., intraindividual consistency) of the measures taken. The athletes were provided with written and verbal instructions requesting that similarity ratings were to be based upon the type of threat perceived, and not upon the amount of threat perceived. Two non-sport examples of situational threat were provided to ensure that respondents understood the concept of perceived threat. The first example described a situation whereby the subject imagined giving a major presentation of his academic work to his peers (simulated fear of failure). The second example described a situation in which the subject imagined fearing for the safety of a close friend who may have been involved in an automobile accident (simulated fear of physical danger).

Each athlete's "7-day-interval test-retest" responses were subjected to an MDS analysis using the INDSCAL program developed by Carroll and Chang (1970). As described previously, the MDS analysis provides a visual representation of the psychological structure underlying each athlete's perceptions of threat. The final $n$-dimensional solution is assumed to represent the "psychological space" in which individuals organise their situational threat perceptions. Situations in close proximity to one another in the psychological space are assumed to be associated with the same type of threat, whereas situations that are further apart are not believed to be connected with the same underlying threat. The researcher's task is to select a dimensionality that provides the most meaningful interpretation of the data; however, consideration of two goodness-of-fit indicators (a stress value; and an $R^2$ value) provide additional guides as to how well the data fit the chosen solution. In general, the investigator is primarily interested in interpreting the dimensions of the resulting solution, although this is neither required nor necessary, and is at the researcher's discretion (Collins, 1987). The idiographic procedures employed in this study focused only upon the cluster interpretations of the MDS solutions to establish the underlying psychological constructs associated with situational threat.

Separate MDS analyses were conducted upon the data of each individual as opposed to the data from the entire group. Conceptually, this analytical procedure can be likened to a P-Technique factor analysis in which the data obtained for each person within a sample is factor analysed, as opposed to an R-Technique in which the data from an entire sample is factor analysed (cf. Schulenberg, Vondracek, & Nesselroade, 1988).

Following the MDS analyses, each athlete participated in a 40 minute interview. Initial interview questions pertained to the athlete's perceived role within the team (including major playing strengths and weaknesses). The remainder of the interview focused on the interpretations of each player's MDS perceptual profile. Participants were asked to review the 15 situations contained within the inventory. Once familiar with the situations, each athlete was shown his respective MDS solution and given the following instructions:

> Imagine that you are looking into a box with three of its sides removed so that you can see inside. Each of the numbered triangles represents the location of a situation within that box. The lines drawn from each triangle show the location of the situations relative to the bottom of the box. Triangles that are close together are generally perceived to be similar in the types of threat that they produce; triangles that are far apart are generally perceived to be different in the types of threat that they produce. Using the pencil [provided], draw a line around the situations that you feel belong to the same cluster. In other words, draw a line around the situations that you feel produce the same types of threat. You may include any situations within your clusters. If there are any situations that are located a long distance from a cluster, but you feel should be included within the grouping, simply extent your line to include them. Likewise, two situations that are close to each other do not have to be included in the same cluster.

None of the athletes expressed having any difficulty with the procedure. Having identified the clusters, the athletes were asked to interpret (in their own words) the situation groupings. The interviewer recorded (in writing) the verbal responses and, at the end of the interview, each athlete reviewed the notes in order to ensure that his perceptions had been recorded accurately. Although the researcher asked the athletes to explain or expand upon many of their statements, the researcher was careful not to lead the respondents into giving responses that could be considered "researcher generated." The athletes were, however, asked if they believed that their responses were influenced by their respective playing positions and playing responsibilities.

The idiographic procedures employed throughout the study follow the recent recommendations of Tenenbaum and Bar-Eli (1992), who proposed that research in sport psychology can be enhanced by integrating both quantitative and qualitative methodologies. The quantitative procedures establish the individual MDS solutions; from these solutions, the researcher can make inferences about each athletes' perceptions of threat. However, the qualitative interview data provides the researcher with "richer" information from which more valid inferences can be made. Having the athletes interpret their own solutions is also in accordance with the beliefs of Allport (1962), who maintained that (under most circumstances) the best qualified expert to judge a person's diagnosis (i.e., solution) is the individual. Therefore, this procedure reduces the likelihood of researchers making unrealistic, biased, or exaggerated claims about their findings—a problem which Smith (1989) cautioned sport psychologists to be wary of.

## Results and Discussion

To facilitate direct comparisons with the group solution (Figure 2-1), three-dimensional solutions were chosen to represent each individual (see Figures 2-2, 2-3, and 2-4). Notably, the goodness-of-fit indicators were much better for the individual solutions than the group solution: winger ($R^2 = .80$, stress = .17), center ($R^2 = .79$, stress = .19), defenseman ($R^2 = .72$, stress = .18). Not surprisingly, the idiographic solutions provided clearer representations of the individuals' perceptions than the group solution did because they are not contaminated with the test score variability caused by the inclusion of the other athletes' responses.

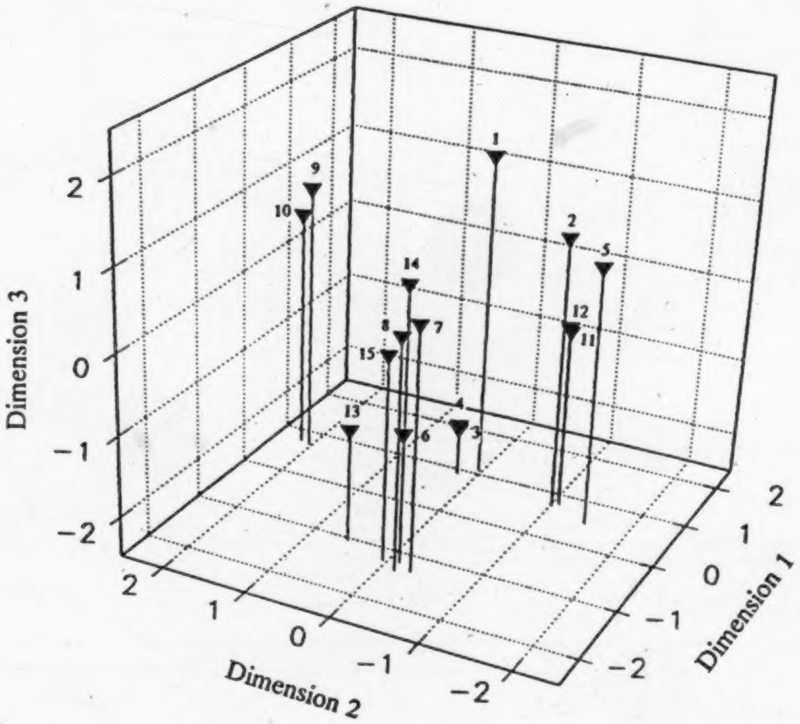

Figure 2-2. Individual three-dimensional solution for the winger.

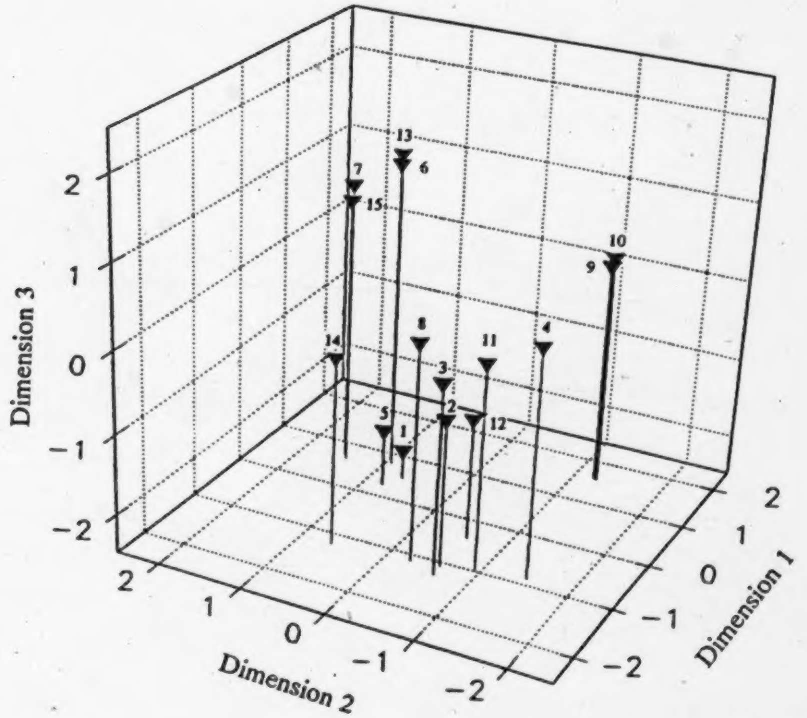

Figure 2-3. Individual three-dimensional solution for the center.

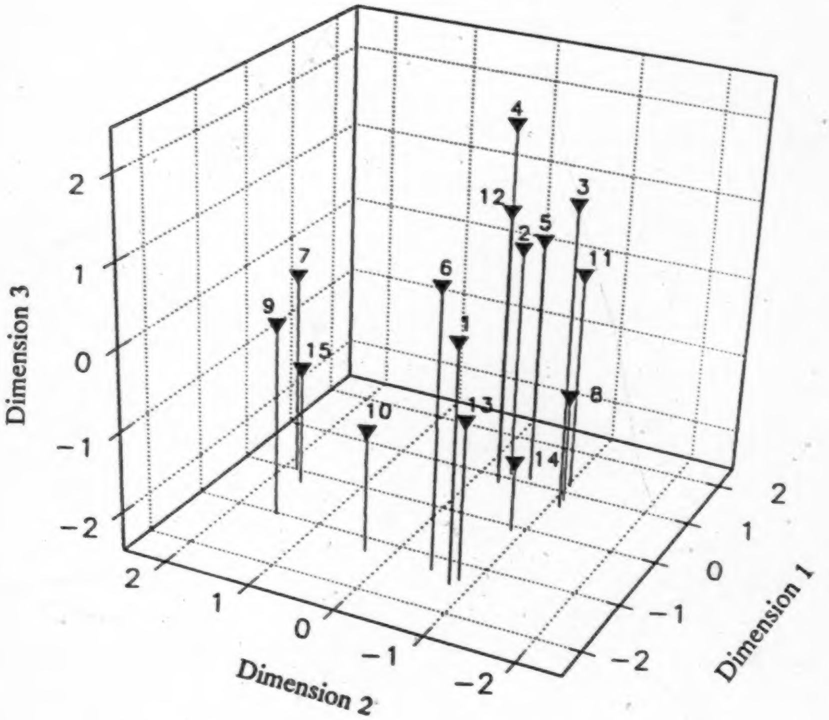

Figure 2-4. Individual three-dimensional solution for the defenseman.

Prior to interpreting the results, it is important to reiterate that the present study was conducted 4 months after the group data had been obtained. Although the individual solutions presented here are valid for the three athletes, the 4-month delay does increase the probability that changes in the athletes' threat perceptions may have occurred since the time of the original group testing (Pedhazur & Schmelkin, 1991). Consequently, when the original group solution is compared against the individual solutions, it should be acknowledged that some of the differences may have been caused by the experiences the athletes underwent during the 4 months following the initial testing. In other words, some of the differences between the group and individual solutions that are noted in this study may not have been present during the original Dunn and Nielsen (1993) study.

To partially assess the likelihood that large changes in the athletes' perceptions had occurred, Pearson product-moment correlation coefficients were calculated to determine the stability of each athletes' data across the 4-month period. Although the resulting coefficients of stability (winger, $r = .59$; center, $r = .60$; defenseman, $r = .59$) do not demonstrate extremely high levels of test-retest reliability, they do indicate that the athletes' perceptions of threat remained fairly stable between testing sessions.

The winger (Figure 2-2) identified the same tight clusters pertaining to the threat of physical harm (Situation 9 = chase puck to corner, and Situation 10 = block slap shot) and the interpersonal threat from the coach (Situation 3 = benched, and Situation 4 = coach criticism) that were evident in the group solution (Figure 2-1). In contrast, although the center (Figure 2-3) also confirmed that Situations 9 and 10 posed physical threats, the coach-situations (Situations 3 and 4) were grouped within a much larger cluster consisting of Situations 2 (undisciplined penalty), 8 (missed penalty shot), 11 (bad pass), 12 (lost marker), and 14 (missed scoring chance). The center said,

> In each of these situations you've already done something wrong. You have to face up to everyone and take responsibility for the mistake that you made. It may be a team game, but things are always broken down individually. They always pick the three stars after the game [to recognise great individual performances] but they also pick the scape goats too.

The center does not distinguish between the interpersonal threat that is evoked by the coach's response, and the personal threat that is experienced when a serious playing error is committed. To this athlete, negative interactions with the coach and performing poorly provide similar threats to his self concept.

The negative certainty/uncertainty construct established in the group solution (Figure 2-1) was highly relevant to the center (Figure 2-3) who identified the anticipatory nature of threat in the cluster containing Situations 6 (face-off), 7 (penalty shot), 13 (penalty killing), and 15 (breakaway). He said, "I tried to break the situations up into those that were happening right now, those that were after the fact, and those that were before the fact. All these situations are before the fact." In contrast, the winger (Figure 2-2) did not view all situations from the anticipatory-versus-consequential perspective. Instead, the winger's playing responsibilities appear to have affected his perceptions towards many situations.

As described earlier, the winger believed that his major role within the team was to "lead by example and score goals." His primary concern in the cluster containing Situations 7 (penalty shot), 8 (missed penalty shot), 14 (missed scoring chance), and 15 (breakaway) was the offensive responsibility he assumed: "The destiny of the team is in your hands. If you don't score, it's going to affect the outcome of the game. These situations cause me more anxiety than other players because I'm expected to score." Therefore, unlike the center (Figure 2-3), the winger did not differentiate between the fear of failure and the consequence of failure in offensive situations.

Further evidence supporting the argument that an athlete's playing position/responsibilities can differentially affect perceptions of threat in specific situations was shown in the comparison between the solutions for the defenseman (Figure 2-4) and the center (Figure 2-3). The defenseman recognised the defensive responsibilities in the cluster formed by Situations 2 (undisciplined penalty), 5 (caught up-ice), 11 (bad pass), and 12 (lost defensive check):

> The defenseman has most responsibility in all these situations. From a defensive perspective, you should be back on 5 [caught up-ice]. The

> opponent shouldn't get a breakaway and if it's not your job to score, you shouldn't be caught up-ice: that is the offenseman's job.

In contrast, the center (Figure 2-3) grouped Situation 5 (caught up-ice) in a cluster with Situation 1 (referee error):

> As a forward, it's not really my fault in [situation] 5. There's only one team forecheck that I'd be responsible in that situation. It's really out of my control if a guy gets a breakaway. I have even less control when the referee makes a bad call. There's just nothing I can do.

Clearly, the defensive and offensive roles of the two athletes mediated how they perceived each situation. Furthermore, the center's responses also demonstrated that the athlete is cognisant of the "controllability" dimension established in the group solution (Figure 2-1).

Situation 1 (referee error) did not form a cluster with any other situations in the group solution (Figure 2-1). However, the defenseman (Figure 2-4) grouped Situation 1 with Situations 6 (defensive face-off) and 13 (penalty killing). The construct of controllability also appears to be highly relevant for this athlete:

> Situation 1 is not your fault and there's nothing you can do about it. Situation 6 is a skill I never practice. I haven't taken a face-off since junior hockey [5 years ago]. I wouldn't want to lose the draw but it's not my job. I wouldn't have much control I don't think, but no one would be expecting me to win the draw.

In reference to Situation 13, the athlete said the following:

> It doesn't look as bad when you lose a goal when penalty killing since people say, "they [the opposition] have a powerplay and they should score." If you are going to give up a goal, it's better to do it when you are penalty killing than when you are even strengthed.

The defenseman's responses also indicate that only a limited amount of personal/ego threat is perceived in all these situations.

The defenseman's response to Situation 6 (face-off) highlighted one possible problem inherent within the nomothetic procedures employed by Dunn and Nielsen (1993); namely, the face-off was not a highly relevant situation for this athlete since his playing position provides virtually no opportunities to take face-offs. This problem may have been avoided if the original stimuli sampling had been done idiographically, however, this would have limited the extent to which a group solution could have been established.

## General Discussion

The present study was conducted within an interactionist framework which posits that behaviour (either overt or covert) is a function of both the person and the situation (Endler & Magnusson, 1976; Magnusson, 1990). An individual's behaviour in any situation is influenced by his or her perceptions of that situation (Pargman, 1993; Ross & Nisbett, 1991). Perceptions are generally based upon the knowledge an individual has acquired from previous encounters with similar situations, or upon the immediate informational input available from the current situation (Higgins, 1990). Therefore, if an individual perceives a situation as threatening to his or her psychological or physical well-being, anxiety is often experienced (Martens, Vealey, & Burton, 1990; Smith & Lazarus, 1990; Spielberger, 1966). However, different individuals may not attach the same psychological meaning to the same situation (Fisher & Zwart, 1982; Klirs & Revelle, 1986; Mischel, 1986; Schulenberg et al., 1988). Therefore, if behaviour in competitive situations is to be understood, the differences in how athletes perceive the same situations must also be understood (Martens et al., 1990). Consequently, researchers are faced with the decision of whether to assess the psychological situation from a nomothetic or an idiographic perspective (Edwards, 1984).

The group profile reported by Dunn and Nielsen (1993) provided considerable information as to how hockey players, on average, perceived a number of threatening situations. The group solution was valuable because it illuminated a number of the psychological constructs upon which athletes base situational threat perceptions; however, a comparison of the individual solutions to the group solution showed many important perceptual differences. A comparison of the individual solutions to the group solution illustrated where some of these perceptual differences existed (as did comparisons between the individual solutions), while the idiographic interview data revealed why some of these differences existed.

The findings of the idiographic analyses suggest that the playing roles which athletes assume within a team can influence their perceptions toward certain situations. Endler (1981) implied that the types of environmental stimuli (i.e., situations) to which individuals are exposed affect their perceptions towards those situations. If Endler's term environment is considered analogous to playing position in the present study, it seems reasonable to suggest that playing in different positions will influence the frequency with which athletes encounter certain types of situations. Consequently, the threat athletes perceive will, in part, be influenced by their interpretations of the responsibilities imposed by their playing positions. This conclusion raises an extremely important question: namely, at what level of "class homogeneity" (Bouffard, 1993, p. 372) can a researcher combine data across subjects to produce a group profile?

It must be acknowledged that the conclusions drawn from this study about the influence of playing position upon situational threat perceptions should be viewed with some degree of caution because only one player from each position was examined. That is, the findings obtained from this study may not be entirely attributable to the athletes' playing positions, but instead, may have been caused by the idiosyncratic nature of the athletes themselves. Nevertheless, the universality of these idiographic "position-related" propositions can be determined by assessing the extent to which these results are found with other athletes who play in the same positions.

The nomothetic procedures employed by Dunn and Nielsen (1993) may have been enhanced by conducting separate MDS analyses on groups of defensive players, center-ice players, and wingers. However, as alluded to previously, playing position is only one athlete characteristic that could influence how situational threats are perceived; other factors, for example, might include age, playing experience, skating ability, physical stature, stick-handling ability, and perceived competence. As the number of variates that could potentially influence a player's perceptions increase, a very pragmatic sampling problem arises: how can such a homogeneous sample be obtained? Indeed, even if a researcher had the available resources to obtain such a sample, there is still no guarantee that a group solution would represent the perceptions of every subject. To this end, Cronbach (1975) cautioned that even when local conditions (e.g., player positions/ characteristics) are taken into account, any generalization should be taken as a working hypothesis, and not as a conclusion.

Lamiell (1981) argues that personality psychologists should aim to develop a theoretical framework from which the description of any given person would be made possible. To this end, Lamiell contends that an idiothetic approach to research is required. The idiothetic approach is predicated on idiographic measures (i.e., initial analyses are done at the individual level); however, this approach becomes nomothetic when the researcher seeks to observe consistencies of the relevant phenomena across individuals. The present study, although not idiothetic in the manner described by Lamiell, is partly idiothetic in that interindividual consistencies were examined by comparing the results established from idiographic measures. Some potential benefits can be gained through the combination of nomothetic and idiographic procedures within a single research paradigm. If the two approaches are applied in a complementary manner, the researcher is able to test the degree to which the nomothetic generalizations apply across individuals, while also determining the extent to which apparently unique characteristics of some individuals are, in fact, applicable at a more universal level (Pervin, 1984).

Klirs and Revelle (1986) contend that there will always be some individuals who are too idiosyncratic in nature to be included in any group level analyses. Nevertheless, the key issue which researchers must address is "whether the techniques of summarization across individuals clarifies by abstracting the most important bits of information, or whether it obfuscates by submerging into averages individual differences that are vital to the understanding of the phenomena under investigation" (Spotts & Schontz, quoted in Pervin, 1984, p. 271). The combined use of nomothetic and idiographic methodologies helps to deal with this dilemma.

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# CHAPTER 3

## Sources of Worry in Collegiate Ice Hockey: Implications for the Assessment of Cognitive Competitive Trait Anxiety

If a more comprehensive understanding of competitive sport anxiety is to be attained, then greater attention must be paid to the manner in which individuals perceive and appraise threat in competitive settings (Dunn & Nielsen, 1993; Martens, Vealey, & Burton, 1990). Stated differently, the psychological meaning that athletes attach to potentially threatening competitive situations must be accounted for (Fisher & Zwart, 1982). However, not all athletes perceive the same threat or react in the same way when confronted with the same situation (Dunn, 1994; Martens et al., 1990). Therefore, if researchers are to explain why different athletes experience different levels of state anxiety (A-state) in the same competitive setting, the underlying reasons that contribute to these differences must be examined (Kroll, 1980; Lewthwaite, 1990).

Numerous researchers (e.g., Edwards, 1984; Hackfort & Schwenkmezger, 1993; Magnusson, 1981; Martens et al., 1990) have emphasised the importance of identifying personality constructs that can influence individuals' perceptions and appraisals of threat. Of those intrapersonal factors believed to affect an athlete's perceptions of threat, competitive trait anxiety (A-trait) has probably received the most attention in the sport psychology literature.

Competitive trait anxiety (CTA) is defined as an individual's "tendency to perceive competitive situations as threatening and to respond to these situations with A-state" (Martens et al., 1990, p. 11). In other words, competitive A-trait is considered to be a fairly stable personality characteristic that predisposes individuals to view competition as threatening. In turn, the appraisal of threat (i.e., the perception of psychological or physical danger: Spielberger, 1989) influences the degree to which state anxiety is experienced. Therefore, unlike the relatively stable nature of trait anxiety, A-state is transitory and fluctuates in intensity according to the degree of environmental threat that an individual perceives at any given time (Spielberger, 1985). The A-state response is differentiated into two main components (Cattell & Scheier, 1961; Martens, Burton, Vealey, Bump, & Smith, 1990): a somatic component (characterised by the perception of unpleasant autonomic-physiological activation) and a cognitive component (characterised by personal worries, concerns, and negative outcome expectations: Morris, Davis, & Hutchings, 1981).

Worry, or "cognitive concern" (Liebert & Morris, 1967, p. 975), has been identified as a key characteristic of the anxiety response (Borkovec, Robinson, Pruzinsky, & DePree, 1983; Hackfort & Schulz, 1989; Lazarus, 1991; Martens, Burton, et al., 1990; Morris et al., 1981; Spielberger, 1989) and the need to study its role within the competitive anxiety process has been emphasised (Gould & Weinberg, 1985; Man, Stuchlíková, & Kindlmann, 1995; Schwenkmezger & Laux, 1986). A number of studies have been conducted to determine the extent to which competitive A-trait influences the types of worries that athletes' experience in competition. Studies with elite junior wrestlers (Gould, Horn, & Spreeman, 1983), youth basketball players (Brustad, 1988), youth baseball players (Brustad & Weiss, 1987), youth soccer players (Passer, 1983) and college athletes from a variety of sports (Rainey & Cunningham, 1988) have shown that high CTA individuals, as compared to low CTA individuals, tend to worry more frequently about factors relating to poor performance and negative social evaluation. Although these findings suggest that competitive A-trait is primarily associated with concerns regarding potential performance failure and negative social evaluation, the existence of other CTA components such as physical danger A-trait (Vitelli & Frisch, 1982) cannot be ruled out (Hackfort, 1986; Martens et al., 1990; Sonstroem, 1984).

In addition to the aforementioned fear of failure and fear of negative social evaluation A-trait dimensions, considerable evidence supporting the existence of other A-trait components has been gathered by researchers in social psychology over the last two decades. In particular, throughout the development of the multidimensional interaction model of anxiety (Endler, 1983), Endler and his colleagues (Endler & Edwards, 1985; Endler, Edwards, Vitelli, & Parker, 1989; Endler, Lobel, Parker, & Schmitz, 1991; Endler, Magnusson, Ekehammar, & Okada, 1976; Endler & Okada, 1975; Endler, Parker, Bagby, & Cox, 1991; Shedletsky & Endler, 1974) have consistently demonstrated that general trait anxiety consists of at least four dimensions: Social Evaluation A-trait, Physical Danger A-trait, Ambiguous A-trait (i.e., fear of the unknown), and

Innocuous/Daily Routine A-trait (Endler, Edwards, & Vitelli, 1991). Based on the content of the trait scale instructions contained in the Endler Multidimensional Anxiety Scales (EMAS) Manual (Endler, Edwards, et al., 1991), Social Evaluation A-trait refers to an individual's tendency to experience anxiety in situations where he/she is being evaluated and/or observed by others. Physical Danger A-trait describes a person's predisposition to experience anxiety in situations where the potential for physical harm exists. Ambiguous A-trait describes an individual's tendency to experience anxiety "in novel, new, or unfamiliar situations" where the individual "is uncertain as to what to expect." Daily Routine A-trait was included in the model "as a baseline for trait anxiety" (Endler & Parker, 1992, p. 190) and characterises the extent to which an individual typically feels anxious when encountering innocuous everyday situations. Although the multidimensional interactional model of anxiety presently contains the four major situational A-trait components described previously, the potential existence of other A-trait dimensions has not been ruled out (Endler, Edwards, et al., 1991; Endler & Parker, 1990).

A multidimensional conceptualisation of trait anxiety has also been advocated by Hackfort (1986; Hackfort & Schwenkmezger, 1989, 1993) in the sport psychology literature. Based on the theoretical formulations of Maslow (1954), Hackfort and his colleagues proposed that *physical harm/injury anxiety*, *failure anxiety*, *disgrace/shame anxiety* (i.e., fear of negative social evaluation), and *anxiety of the unknown*, should all be considered legitimate dimensions of the *competitive* A-trait construct. However, with very few exceptions (e.g., Hackfort, 1986; Vitelli & Frisch, 1982), researchers in sport psychology have made almost no attempt to directly assess the viability of using the multidimensional A-trait frameworks suggested by Endler (1983) and Hackfort (1986) in the measurement of competitive A-trait (see Martens, 1978, for a related discussion).[1] This lack of attention to a multidimensional conceptualisation of competitive A-trait in the competitive sport anxiety literature seems surprising, given that a number of sport psychologists have found that athletes experience anxiety and recognise threat in competition for reasons other than those associated with the fear of failure and the fear of negative social evaluation.

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[1] Unless stated otherwise, throughout this paper the term *multidimensional* A-trait will refer to the *situational* dimensionality of A-trait (as proposed by Endler [1983] and Hackfort [1986]) and not to the multidimensional distinction between somatic and cognitive anxiety.

Dunn and Nielsen (1993) showed that the unknown consequence of making a mistake and the potential for physical harm are salient situational threats for male collegiate ice hockey and soccer players. Kroll (1980) and Eklund (1994) also found that athletes report concerns about injury and other uncontrollable factors pertaining to officiating and the conduct of opponents. Similarly, Dunn and Nielsen (1996) found that male and female collegiate athletes competing in a number of team sports (basketball, field hockey, ice hockey, and soccer) associate competitive anxiety with uncontrollable circumstances relating to potential injury, officiating, and the behaviour of team mates and opponents. However, despite identifying various situational threats that exist in competitive sport, none of the previous studies directly assessed the degree to which athletes were susceptible to experiencing anxiety as a consequence of these threats. Therefore, the extent to which athletes actually worry about these situational threats remains unclear.

Given that athletes recognise various sources of threat in competition, and assuming that a multidimensional CTA construct is theoretically possible, it seems reasonable to suggest that individual differences may exist in the tendency for athletes to experience different kinds of worry. In other words, the worry component of competitive A-trait may be conceptualised as a multidimensional construct. If so, the sources of worry that contribute to an athlete's anxious response need to be identified and examined (Gould & Weinberg, 1985).

At present, no CTA inventories have been developed to assess an athlete's predisposition to worry about all the factors previously described (i.e., fear of injury, fear of failure, fear of negative social evaluation, fear of the unknown). Indeed, the most widely used CTA instrument—the Sport Competition Anxiety Test (SCAT: Martens, 1977)—provides little information concerning the actual causes of anxiety (Kroll, 1980). Eight of the ten SCAT items that measure competitive anxiety describe somatic components of the anxious response (Lewthwaite, 1990). However, Kroll (1980) points out that two athletes can "exhibit a similar emotional [i.e., somatic] response to different aspects of competition" (italics added, p. 219). Thus, if two athletes receive the same composite CTA scores on the SCAT, it cannot be determined whether anxiety is experienced due to concerns about injury, poor performance, potential embarrassment, or a combination of these (and other) factors.

From an applied perspective, a lack of information pertaining to the factors that cause the anxious response will seriously hinder the development of psychological skills programs aimed at helping athletes cope with anxiety. That is, if an athlete is susceptible to a particular situational threat (or threats) within the competitive sport environment, intervention programs will probably be most effective if directed at those specific threats most salient to that individual (Maynard, Hemmings, & Warwick-Evans, 1995; Smith, Smoll, & Schutz, 1990). To this end, Martens et al. (1990) point out the need to develop subscales that measure different components of competitive A-trait (e.g., fear of injury, fear of failure). Before such CTA subscales can be developed, however, the cognitive dimensions upon which athletes base their perceptions of competitive threat and worry must first be identified (Dunn & Nielsen, 1993). Using factor analytic procedures, Gould et al. (1983) obtained a three factor solution (fear of failure-feelings of inadequacy, external control-guilt, fear of evaluation) that provided some initial insight into the dimensionality of young athletes' worries (age 13 - 19 years). However, few researchers have attempted to replicate and extend these findings, and studies using older athletes have been particularly lacking.

If the cognitive dimensions of competitive-worry are to be identified, situational threats which correspond to these dimensions must be present within the competitive environment being studied. That is, researchers investigating the existence of particular dimensions of competitive-worry must carefully select competitive environments that have the potential to elicit the underlying threats of interest. For example, an athlete who worries before the start of competition about getting hurt clearly perceives that the pending event poses a physical danger. If no potential for physical danger is inherent within the competitive environment, then there is no apparent reason why the athlete should worry about getting hurt (cf. Endler, King, & Herring, 1985; Flood & Endler, 1980; Jackson & King, 1993).

It should be noted, however, that even if an objective physical danger is present within the environment, not all athletes will necessarily perceive this threat. In other words, irrespective of whether an objective physical danger actually exists, the threat of physical harm may not be apparent to every athlete because not all individuals perceive or interpret the same stimuli (i.e., situations) in the same way (Dunn, 1994; Endler & Parker, 1990; Pargman, 1993). Thus, by attempting to identify the underlying dimensions of competitive worry, the present study will provide information regarding athletes' perceptions of the competitive environment. Such perceptual information is very important if a better understanding of competitive anxiety is to be attained (Rotella & Lerner, 1993).

Research indicates that ice hockey provides a setting in which a variety of situational threats exists (e.g., Dunn, 1994; Dunn & Nielsen, 1993, 1996). Indeed, hockey appears to contain many of the threats that are congruent with the physical danger/injury, performance failure, social evaluation/disgrace, and uncertainty dimensions contained within Endler's (1983) multidimensional interactional model of anxiety and Hackfort's (1986) multidimensional conceptualisation of competitive A-trait. If a multidimensional competitive A-trait construct is valid, then hockey players should be expected to recognise various sources of worry that correspond to these dimensions. Hence, the first purpose of this study was to examine whether the proposed CTA dimensions pertaining to physical danger, performance failure, negative social evaluation, and situational uncertainty actually provide a viable framework for interpreting the underlying sources of cognitive anxiety (i.e., worry) in the sport of ice hockey. To this end, a major component of this study involved the development of a sport-specific CTA inventory that assessed the degree to which varsity hockey players are predisposed to experiencing various competitive worries.

The second purpose of this study was to determine whether hockey players differentiate between worries about performance failure and worries about negative social evaluation—the two traditional sources of worry that are most commonly associated with competitive sport anxiety. Previous sport anxiety research has differed considerably in the treatment and conceptualisation of the two constructs. Many researchers have treated the two constructs as separate factors (e.g., Brustad, 1988; Gould et al, 1983; Passer, 1983; Rainey & Cunningham, 1988), while others have collapsed the constructs into a single dimension (e.g., Kroll, 1980; Lewthwaite, 1990; Smith et al., 1990; Weiss, Wiese, & Klint, 1989). Given this lack of conceptual clarity, Hosek and Man (1989) theorised that fear of failure anxiety can be split into "worry about the correctness of one's performance" (p. 248) and "the fear of social consequences [i.e., fear of negative social evaluation]" (p. 248). In other words, Hosek and Man appear to be proposing a hierarchical structure in which the fear of failure encompasses two distinct, yet highly related, components.

The third and final purpose of this study was to examine the relationship between athletes' worry tendencies and their CTA levels as measured by established competitive A-trait instruments (i.e., the SCAT, and the Sport Anxiety Scale [SAS]: Smith et al., 1990). It was hypothesised that worries relating to performance failure and negative social evaluation would be more characteristic of high CTA hockey players (as measured by the SCAT and SAS) than low CTA athletes. Given the lack of research into the relationship between competitive A-trait and the other proposed constructs (i.e., fear of physical danger and fear of the unknown), no directional hypotheses pertaining to these variables were established.

In summary, the present study can be conceptualised as an attempt to examine the coverage of the nomological network (Cronbach & Meehl, 1955) that currently envelops the construct of cognitive competitive trait anxiety. Although a strong theoretical framework provides valuable guidance and direction for research (Smith & Glass, 1987), Palys (1992) points out that theories often constrain researchers by blinding them "to other variables or other perspectives that are beyond the scope of the theory" (p. 45; see also Pedhazur & Schmelkin, 1991, pp. 182-183). To this end, sport psychologists have been cautioned against locking into a particular theory (see Feltz, 1989; Landers, 1983, 1989; Morgan, 1980) since this ultimately hinders the development of sport psychology as a scientific discipline (Landers, 1983). Given the lack of empirical investigation into

Endler (1983) and Hackfort's (1986) multidimensional conceptualisation of A-trait in the sport psychology literature, it appears that sport anxiety researchers have limited their focus to the ego-threatening aspect of competitive sport—a central construct in the field's most prominent competitive sport anxiety theory developed by Martens et al. (1990).

## Method

### Participants

Varsity-level athletes (excluding goaltenders) from four western Canadian university- and six western Canadian college-hockey teams participated in the study. Participation was voluntary and written informed consent was obtained from 178 athletes (mean age = 22.27 years; SD = 1.62). On average, participants had 2.06 years playing experience (SD = 1.12) at the varsity level. As discussed previously, the sport of ice hockey was chosen because research indicates that a variety of situational threats which correspond to a number of potential sources of competitive worry seem to exist within the sport (Dunn & Nielsen, 1993).

### Instruments

Athletes completed a total of five questionnaires: a demographic questionnaire, the Sport Competition Anxiety Test (SCAT), the Sport Anxiety Scale (SAS), a newly developed Collegiate Hockey Worry Scale (CHWS) which was constructed for the purpose of this research, and a paired-comparison Similarity Ratings Scale (SRS: cf. Dunn & Nielsen, 1993).

Demographic Questionnaire. The demographic questionnaire (see Appendix A) contained nine items. Questions focussed primarily upon the athletes' age, playing experience, and playing responsibilities (e.g., playing position).

Sport Competition Anxiety Test. The SCAT was used to measure athletes' levels of competitive trait anxiety in hockey (see Appendix B). The test consists of 15 items, ten of which measure an individual's predisposition to experience anxiety in competition (e.g., "Before I compete I am calm." "Before I compete I usually get uptight."). The remaining five items are unrelated to the construct of anxiety (e.g., feelings about goal setting in sport) and are contained within the inventory to reduce potential response bias.

The standard instructions on the SCAT generally request respondents to indicate how they "usually feel when competing in sports and games." However, to make the instrument more relevant to the athletes in this study, the phrase "sports and games" was replaced with the word "hockey." On a 3-point scale (1 = hardly ever, 2 = sometimes, 3 = often) respondents indicate the extent to which they experience each of the ten anxiety symptoms. The scores for the ten items are summed to provide an overall measure of CTA, with a high composite SCAT score (as opposed to a low composite score) reflecting a greater tendency to experience anxiety in the competitive hockey environment. A detailed description of the extensive development and validation of the SCAT is documented by Martens et al. (1990). The SCAT has become the most commonly used measure of CTA by sport psychologists (Gould & Krane, 1992) and, as of 1990, had been employed in over 80 published empirical studies (Martens et al., 1990).

Sport Anxiety Scale. The SAS (see Appendix C) was also used to measure competitive A-trait. Unlike the SCAT (which focuses primarily upon somatic components of the anxious response) the SAS measures both cognitive and somatic dimensions of competitive A-trait. The SAS contains 21 items that measure somatic A-trait (9 items), cognitive worry A-trait (7 items), and concentration disruption A-trait (5 items). Using a 4-point scale (1 = not at all; 4 = very much so) respondents indicate how they generally feel before or during competition. Strong psychometric evidence supporting the factoral validity of the SAS is reported by Smith et al. (1990), and is based upon replicated exploratory and confirmatory factor analyses with separate samples.

Based on responses from a sample of 451 high school varsity athletes, Smith et al. (1990) also report acceptable levels of internal consistency using coefficient alpha ($\alpha$: Cronbach, 1951) for all three SAS subscales (somatic scale = .92; worry scale = .86; concentration disruption scale = .74). In a more recent study, using data obtained from a combined sample of 251 male and female high school varsity, college varsity, and recreational college athletes, White and Zellner (1996) reported SAS subscale internal consistencies using coefficient alpha of .90 (somatic), .84 (worry), and .71 (concentration disruption).

Using a sample of high school varsity athletes ($N$ = 490), Smith et al. (1990) obtained a significant correlation ($r$ = .81) between total SAS scores (i.e., combined subscales) and composite SCAT scores; significant positive correlations between the three SAS subscales and total SCAT scores were also obtained (somatic = .81; worry = .66; concentration disruption = .47). These correlations lend further support for the construct validity of the SAS.

Due to its relative infancy, the SAS has not figured prominently in published research since its development (Jones, 1995a). Nevertheless, the psychometric properties of the SAS reported by Smith et al. (1990) provide impressive support for the instrument's validity and for its future use in CTA research (Jones, 1995b). Indeed, Gill (1997) goes so far as to suggest that the SAS will likely "replace the unidimensional SCAT in research applications based on multidimensional approaches to sport anxiety [where "multidimensional" refers to the distinction between somatic and cognitive anxiety]" (p. 42). However, it should be noted that no published research has used the SAS with a sample that is comparable with the athletes who participated in this study.

Collegiate Hockey Worry Scale. The Collegiate Hockey Worry Scale (CHWS: see Appendix D), developed in the present study, was constructed to assess the predisposition of hockey players' to experience pre-game worries relating to physical danger (e.g., "I worry about the opposition playing chippy physical hockey"), negative social evaluation (e.g., "I worry about other people being disappointed with me"), performance failure (e.g., "I worry about making mistakes"), and uncertain/unknown competitive conditions (e.g., "I worry about what to expect from teams I know little about"). The scale contains 16 items, with four items measuring each of the four worry dimensions. (A detailed description of the procedures used to generate and select the 16 items is provided later.)

Respondents are instructed (in writing) that the purpose of the questionniare is to identify the aspects of competition that hockey players generally worry about before competing. Using a 5-point rating scale (1 = not at all like me; 5 = very much like me) respondents rate the degree to which each of the 16 worry-statements characterises the way they generally feel or think before competition.

Similarity Ratings Scale. The similarity ratings scale (SRS: see Appendix E) was used to assess athletes' perceptions of the latent psychological characteristics underlying the 16 worry-items that were included in the CHWS. In other words, the SRS was used to assess athletes' perceptions of the cognitive dimensions upon which competitive worries in hockey are based. The scale has the same presentation-format as the similarity ratings scales used in the previous chapter (Dunn, 1994) and by Dunn and Nielsen (1993) in their examination of situational threat perceptions among hockey and soccer players.

Items are presented to respondents in the form of a category-rating technique (Davison, 1983) which involves the presentation of all possible pairs ($n$ = 120) of items. In other words, each of the 16 worry-items is paired with every other item in the inventory. Respondents examine the content of both items in each item-pairing, and then rate the item-pairing according to the similarity of the "underlying reason for worry" that is described in each item. Ratings are made on a 9-point scale ranging from 0 (very similar) to 8 (not at all similar).

To illustrate the similarity rating procedure, the following example is provided. An athlete is presented with two items—Item 3 (Worry about making mistakes) and Item 16 (Worry about playing poorly). If the athlete perceives that the underlying reasons for concern in each item in the item-pairing are very similar (e.g., both relate to worries about performance failures), then a rating of 0 (very similar) would be appropriate.

Ross-ordering (Ross, 1934) of the items was employed throughout the scale to reduce potential response bias caused by item presentation order effects. It should be emphasised that athletes were not given any information about the hypothesised latent psychological characteristics that were believed to be associated with the various items. In other words, respondents' similarity judgements were not biased by the researcher's expectations to find four latent dimensions relating to the fear of injury, fear of failure, fear of negative social evaluation, and fear of the unknown.

### Item Selection and Content Relevance

As stated previously, the 16 items contained within the CHWS were chosen to reflect hockey players' potential worries regarding injury, performance failure, negative social evaluation, and uncertainty. Where possible, items were selected (or adapted) directly from athlete-generated responses that were obtained from data collected in previous studies that examined sources of situational threat in ice hockey (Dunn, 1994;

Dunn & Nielsen, 1996). The use of athlete-generated items (as opposed to researcher-generated items) for the purpose of scale construction in competitive anxiety research has been advocated by a number of sport anxiety researchers (e.g., Dunn & Nielsen, 1993; Hanin & Syrjä, 1995) because this increases the likelihood that the items will be relevant to future test users (i.e., the athletes themselves). Items were also selected (or adapted) directly from other studies examining sources of stress and worry in competitive sport (e.g., Gould et al., 1983; Kroll, 1980; Lewthwaite, 1990; Passer, 1983; Rainey & Cunningham, 1988; Weiss et al., 1989).

Measurement specialists recommend that once an initial item pool has been generated, the "content relevance" (Messick, 1980, p. 1017) of the items (i.e., the degree to which the items represent the constructs of interest) should be assessed (Crocker & Algina, 1986). Establishing content relevance is a key concern during questionnaire development (Standards for Educational and Psychological Testing, 1985) and involves judgements concerning the degree of match between "the content of a test [i.e., items] and the objectives to be measured by that test" (Hambleton, 1980, p. 82). In this study, the match between the content of the 16 worry items and the four worry dimensions (i.e., injury, failure, social evaluation, and uncertainty) was sought.

Expert judges. Prospective judges for the panel of content-specialists were contacted by phone, e-mail, or regular mail to determine their willingness and availability to participate in assessment of the items. Content-relevance rating scales were mailed to willing participants together with pre-paid self-addressed envelopes. All judges returned their item assessments within 8 weeks of the original mailing.

A panel of content specialists consisting of 12 sport psychologists, 12 university/collegiate hockey coaches, and 12 individuals with previous Canadian university/college varsity hockey experience was established. Each of the 12 sport psychologists had a PhD in sport psychology (or a closely related discipline), had published in international refereed sport psychology journals, and at the time of completing the item ratings worked in physical education, kinesiology, or sport studies/ sport science departments at North American universities. The 12 coaches who provided judgements were all head coaches of university/college hockey teams and had an average of 6.42 years (SD = 5.42) of head coaching experience at the university/college level. The past-players had an average 3.83 years (SD = 1.27) of university/college varsity hockey experience, and nine of the 12 individuals had played university/college varsity hockey for at least 4 years.

The head coaches and past-players were included in the expert-panel because these individuals can be considered to have "expert familiarity with the population for whom the test is intended" (Crocker & Algina, 1986, p. 82). The use of coaches and players as content specialists deviates from the traditional content-relevance procedures employed in sport psychology research. Most sport psychology research that has assessed item content-relevance has relied primarily upon the expert opinions of sport psychologists for making the content-relevance judgements; in doing so, the valuable opinions of the individuals for whom the items and tests are actually intended (i.e., the athletes themselves) have been overlooked.

Rating scale procedures. Although expert judgements are frequently used during the item construction phase of questionnaire-development, Messick (1989, p. 39) contends that systematic attempts to document and assess the item-ratings provided by expert-judges are far from common place. Therefore, in response to Messick's (1989) concerns, a content-relevance protocol that permitted the systematic quantitative assessment of judges' ratings was developed for this study.

The first step in establishing item content-relevance is to define the universe or domain of content that the items are intended to measure (Standards for Educational and Psychological Testing, 1985, p. 10). The "domain specifications" for the four worry constructs were generated by the researcher, and were adapted from the theoretical constructs proposed in Endler's (1983) multidimensional interactional model of anxiety and Hackfort's (1986) multidimensional conceptualisation of competitive A-trait. Figure 3-1 contains the domain specifications that were given to the content judges.

**1) Fear of Injury/Physical Danger**

These are statements in which the athlete's primary concern focuses upon competitive factors that are strongly related to the ***possibility of getting hurt or injured***.

**2) Fear of Negative Social Evaluation**

These are statements in which the athlete's primary concern focuses upon ***how other people will view or judge him***. This may include *potential evaluations* from the coach, teammates, opponents, friends, family, or spectators.

**3) Fear of Failure**

These are statements in which the athlete's primary concern focuses upon ***potential performance failures*** (e.g., concerns about errors or other factors that could hinder personal or team success).

**4) Fear of the Unknown**

These are statements in which the athlete's primary concern focuses upon (or is caused by) ***not knowing what to expect***. These statements focus on general uncertainties surrounding such things as the game, opponents, officiating, ice conditions, etc.

Figure 3-1. Domain specifications for the four cognitive worry A-trait dimensions given to judges.

Once familiar with the domain specifications, judges examined the 16 worry-items that were to be included in the CHWS. After reviewing the items, judges independently rated the degree to which the content of each item (i.e., underlying reason for concern) matched the content of the four domain specifications; ratings were done on a 5-point scale ranging from 1 (poor match) to 5 (excellent match). Having the judges rate the content-match between each item and all four domain specifications ensured that ratings were not biased by the researcher's expectations for item-domain matches. For example, many item content-relevance assessment procedures simply ask judges to rate the match between an item and the domain specification for which the item is designed to measure; this type of assessment immediately informs judges as to the intended domain/construct that test-developer wishes to assess. The assessment protocol used in this study thereby ensured that the judges were "blind" to the intended item-domain matches, which in turn reduced potential rating bias. Finally, after rating each item, judges were encouraged to provide any comments regarding the wording or content of the items.

Quantitative assessment of item content-relevance ratings. Table 3-1 contains the mean content-relevance ratings for the "domain specification of interest" for each item. With the exception of the sport psychologists' rating of Item 14 ($M = 3.83$), every mean content-relevance rating had a value of 4.0 (Very Good Match) or greater. These high mean ratings provide initial evidence regarding the content-relevance of the items.

The content-relevance ratings contained in Table 3-1 are encouraging, however, Aiken (1985) suggests that the statistical assessment of judges' ratings would improve the rigour of the content validation process. Therefore, two statistical procedures were employed to assess the judges' ratings: Aiken's (1985) item content validity coefficient ($V$) and Cohen's (1977) effect size index for dependent means.

Table 3-1

Mean Item Content-Relevance Ratings for the Worry Construct (Domain Specification) that Each Item was Originally Designed to Measure

| | | Sport Psychologists $^a$ | | Coaches $^a$ | | Athletes $^a$ | | Total Sample $^b$ | |
|---|---|---|---|---|---|---|---|---|---|
| Item | Content Domain $^c$ | M | (SD) | M | (SD) | M | (SD) | M | (SD) |
| 1. | Inj. | 4.00 | (1.55) | 4.42 | (.67) | 4.00 | (1.04) | 4.14 | (1.12) |
| 2. | Eval. | 4.75 | (.45) | 4.58 | (.79) | 4.42 | (.90) | 4.58 | (.73) |
| 3. | Fail. | 4.58 | (.67) | 4.67 | (.49) | 4.50 | (.67) | 4.58 | (.60) |
| 4. | Eval. | 4.92 | (.29) | 4.58 | (.51) | 4.42 | (.90) | 4.64 | (.64) |
| 5. | Unkn. | 4.83 | (.39) | 4.75 | (.45) | 4.67 | (.49) | 4.75 | (.44) |
| 6. | Inj. | 4.42 | (.67) | 4.33 | (1.07) | 4.17 | (.94) | 4.31 | (.89) |
| 7. | Eval. | 5.00 | (.00) | 4.92 | (.29) | 4.75 | (.62) | 4.89 | (.40) |
| 8. | Fail. | 5.00 | (.00) | 4.83 | (.39) | 4.33 | (.78) | 4.72 | (.57) |
| 9. | Unkn. | 4.92 | (.29) | 4.83 | (.39) | 4.67 | (.49) | 4.81 | (.40) |
| 10. | Inj. | 4.67 | (.49) | 4.50 | (1.00) | 4.33 | (.78) | 4.50 | (.77) |
| 11. | Unkn. | 4.58 | (.51) | 4.83 | (.39) | 4.25 | (1.06) | 4.56 | (.73) |
| 12. | Inj. | 4.92 | (.29) | 4.75 | (.87) | 4.67 | (.65) | 4.78 | (.64) |
| 13. | Eval. | 4.83 | (.39) | 4.92 | (.29) | 4.50 | (1.00) | 4.75 | (.65) |
| 14. | Fail. | 3.83 | (1.19) | 4.42 | (.90) | 4.33 | (.78) | 4.19 | (.98) |
| 15. | Unkn. | 4.67 | (.65) | 4.67 | (.49) | 4.50 | (.80) | 4.61 | (.64) |
| 16. | Fail. | 4.25 | (.97) | 4.75 | (.45) | 4.00 | (.74) | 4.33 | (.79) |

Note. Ratings were done on a 5-point scale (1 = Poor Match; 5 = Excellent Match). $^a$ n = 12. $^b$ N = 36. $^c$ Content Domain Abbreviations: Inj. = Fear of Injury; Eval. = Fear of Negative Social Evaluation; Fail. = Fear of Failure; Unkn. = Fear of the Unknown.

Aiken's (1985) content validity coefficient (V) allows the researcher to test the statistical significance of judges' ratings for the construct (i.e., domain specification) that the item was designed to measure. In other words, V is calculated for the ratings provided by n judges on the keyed "domain specification of interest" for each item. The use of V as a test statistic in this study is appropriate since V assesses content relevance ratings that are based on rating scales of c successive integers; in this study, the ratings were done on a scale with five successive integers (i.e., 5-point scale). Values of V can range from 0 to 1. A value of 1 indicates that all n judges give an item the highest possible score on the rating scale (i.e., item-domain match = 5) and a value of 0 indicates that all n judges give an item the lowest possible score on the rating scale (i.e., item-domain match = 1). The statistical significance of V is then obtained by comparing the computed value of V (for n judges and c successive integers on the rating scale) against a right-tailed binomial probability table provided by Aiken (1985, p. 134). The reader is referred to Aiken (1985) for a detailed discussion of V and its calculation.

Separate values of V for each item were calculated for the ratings provided by the sport psychologists, coaches, and past-players; thus, the statistical significance of 48 item-domain matches were assessed. With the exception of the sport psychologists' ratings of Items 1 ($V = .75$, $p < .05$) and 14 ($V = .71$, $p < .05$), the remaining 46 values of V were statistically significant at $p < .01$. These results strongly indicate that all 16 items (as rated by the content-judges) appear to be measuring the constructs that they were initially intended to measure.

The data contained within Table 3-1 and the results provided by the V statistic calculations fail to consider that the content of each item was rated against four domain specifications (as opposed to just one domain specification). In other words, the V statistic provides no information regarding an item's content match with the three domain specifications for which the item was *not* intended to measure. It is therefore necessary to determine whether the items (as rated by the content-judges) are primarily measuring their intended domain specification, or whether the items are also measuring the other domain specifications that are under investigation. Conceptually, this process is analogous to a primitive assessment of the latent dimensionality of the items, and although item dimensionality is traditionally assessed during the "construct validation" phase of the research process (e.g., with analytical procedures including Factor Analysis and Multidimensional Scaling) there is nothing to prevent the researcher from acquiring an "intuitive feel" for item dimensionality during the earliest stages of questionnaire construction. Table 3-2 provides an example of how all 36 judges rated the content of Item 2; this profile typifies the general rating patterns that were obtained for all 16 items.

Table 3-2

Frequency and Descriptive Statistics for Judges' (N = 36) Item Content-Relevance Ratings of Item 2 ("Worry about what my teammates will think if I let them down")

| | Rating Category | | | | | | |
|---|---|---|---|---|---|---|---|
| | Poor Match | Fair Match | Good Match | Very Good Match | Excellent Match | | |
| Construct | 1 | 2 | 3 | 4 | 5 | M | (SD) |
| Evaluation [a] | 0 | 0 | 5 | 5 | 26 | 4.58 | (0.73) |
| Failure | 6 | 7 | 9 | 9 | 5 | 3.00 | (1.31) |
| Injury | 30 | 5 | 0 | 1 | 0 | 1.22 | (0.59) |
| Unknown | 18 | 12 | 3 | 2 | 1 | 1.78 | (1.02) |

[a] Fear of Negative Social Evaluation was the keyed response.

To determine whether the items primarily measured the constructs they were designed to measure, planned mean contrasts (n = 3) between the content-relevance score for the construct of interest and the content-relevance score for the three remaining constructs were conducted for each item. Rather than conducting 16 multivariate repeated measures analyses of variance with follow up univariate F-tests on each item (which would greatly increase the likelihood of committing a type-I error), effect sizes (ES) were calculated for each contrast. Conceptually, multiple ES computations are not subject to the problems associated with significance testing (i.e., with respect to committing type-I errors) because inferences regarding the acceptance or rejection of the null hypothesis are not made; consequently, the problem of incorrectly rejecting the null hypothesis is alleviated. Furthermore, ES has the added advantage over significance testing in that ES provides the researcher with information about the magnitude or size of the difference between the two means being compared. Therefore, unlike significance testing, ES provides "some indication of the practical significance of an effect" (Prentice & Miller, 1992, p. 160).

Effect sizes were computed for the combined mean item content-relevance scores provided by all 36 judges. Since the mean item content-relevance scores for each domain specification were provided by the same judges, Cohen's (1977) ES for dependent means ($d_z'$) was computed (see formula in Appendix F). Table 3-3 shows the four domain specification mean content-relevance scores for each item together with the ES for each planned comparison. In accordance with Cohen's (1977, p. 40) guidelines for interpreting $d_z'$, a value of .80 or greater was considered to show a large ES and a value ranging from .50 to .79 was considered to represent a moderate ES. As shown in Table 3-3, 45 of the 48 effect sizes for the planned contrasts were large ($d_z' \geq .80$), and the three remaining effect sizes were moderate (.66, .55, .62). These ES values, combined with the statistical significance of Aiken's V statistics, provide strong support for the content-relevance of the items.

Table 3-3

Mean Content-Relevance Scores and Mean-Difference Effect Sizes for Ratings Provided by 36 Judges

| | Mean Construct Ratings | | | | Effect Sizes for Planned Mean Contrasts [b] | | |
|---|---|---|---|---|---|---|---|
| Item [a] | Eval. | Fail. | Inj. | Unkn. | Contrast 1 | Contrast 2 | Contrast 3 |
| 1 [i] | 2.11 | 2.11 | **4.14** | 2.89 | i - e (1.15) | i - f (1.04) | i - u (.80) |
| 2 [e] | **4.58** | 3.00 | 1.22 | 1.78 | e - f (1.05) | e - i (3.29) | e - u (2.31) |
| 3 [f] | 3.61 | **4.58** | 1.22 | 1.97 | f - e (.66) | f - i (4.25) | f - u (2.21) |
| 4 [e] | **4.64** | 3.11 | 1.28 | 1.89 | e - f (.88) | e - i (3.61) | e - u (2.29) |
| 5 [u] | 2.28 | 2.97 | 2.25 | **4.75** | u - e (1.96) | u - f (1.27) | u - i (2.07) |
| 6 [i] | 2.03 | 2.22 | **4.31** | 3.47 | i - e (1.66) | i - f (1.51) | i - u (.55) |
| 7 [e] | **4.89** | 2.97 | 1.31 | 2.06 | e - f (1.16) | e - i (3.48) | e - u (2.40) |
| 8 [f] | 2.97 | **4.72** | 1.11 | 1.92 | f - e (1.22) | f - i (5.55) | f - u (2.31) |
| 9 [u] | 2.00 | 2.92 | 1.94 | **4.81** | u - e (2.65) | u - f (1.25) | u - i (2.61) |
| 10 [i] | 2.17 | 2.14 | **4.50** | 2.67 | i - e (1.68) | i - f (1.51) | i - u (1.19) |
| 11 [u] | 2.00 | 2.75 | 2.11 | **4.56** | u - e (1.98) | u - f (1.33) | u - i (2.01) |
| 12 [i] | 1.94 | 1.89 | **4.78** | 2.67 | i - e (1.86) | i - f (1.94) | i - u (1.24) |
| 13 [e] | **4.75** | 2.83 | 1.22 | 1.75 | e - f (1.19) | e - i (4.06) | e - u (2.14) |
| 14 [f] | 2.78 | **4.19** | 1.61 | 2.19 | f - e (1.00) | f - i (1.98) | f - u (1.22) |
| 15 [u] | 2.11 | 2.75 | 2.11 | **4.61** | u - e (1.87) | u - f (1.28) | u - i (2.07) |
| 16 [f] | 3.28 | **4.33** | 1.36 | 2.06 | f - e (.62) | f - i (2.83) | f - u (1.57) |

[a] Letters in square brackets [ ] identify the construct that each item was originally designed to measure: [e] = Fear of Negative Social Evaluation; [f] = Fear of Failure; [i] = Fear of Injury; [u] = Fear of the Unknown.

[b] Effect sizes were calculated using Cohen's (1977) effect size index (d) for dependent means.

Although the items were deemed to have acceptable content-relevance, a number of judges provided written feedback with respect to the wording or content of the items. Based on this feedback, a number of minor alterations to the wording of some items was conducted. For example, Item 8 originally read, "I worry about playing poorly and the team losing." However, one of the sport psychologists who rated the items commented that the item contained two distinct sources of concern—worry about playing poorly (which reflected concern over one's personal performance), and worry about the team losing (which reflected concern about the outcome of the game). Consequently, Item 8 was reworded as follows: "I worry about playing poorly." The final set of 16 items that comprised the Collegiate Hockey Worry Scale is shown in Figure 3-2.

Messick (1980) points out that, in and of itself, content relevance does not ensure valid test-score inferences. However, the assessment of content relevance is a necessary and valuable step in the never ending construct validation process (Hambleton, 1980) and all things being equal, "more sources of [validity] evidence are better than fewer" (Standards for Educational and Psychological Testing, 1985, p. 9).

| Item [Domain] | Item Description |
|---|---|
| 1. [Injury] | I worry about the opposition playing physical chippy hockey. |
| 2. [Evaluation] | I worry about what my teammates will think if I let them down. |
| 3. [Failure] | I worry about making mistakes. |
| 4. [Evaluation] | I worry about other people being disappointed with me. |
| 5. [Unknown] | I worry about not knowing the characteristics of the players I'll be up against. |
| 6. [Injury] | I worry about opponents getting "out of control" in physical bad-tempered games. |
| 7. [Evaluation] | I worry about how the coach will view my performance. |
| 8. [Failure] | I worry about playing poorly. |
| 9. [Unknown] | I worry about what to expect from teams I know little about. |
| 10. [Injury] | I worry about the opposition playing dirty physical hockey. |
| 11. [Unknown] | I worry because I don't feel that I know how the opposition will play. |
| 12. [Injury] | I worry about opponents who are known for their dirty stick work. |
| 13. [Evaluation] | I worry about spectators or friends forming a poor impression of me. |
| 14. [Failure] | I worry about not being ready or "psyched up" enough to play my best. |
| 15. [Unknown] | I worry because I don't know what to expect in the game. |
| 16. [Failure] | I worry about not performing up to the best of my ability. |

Figure 3-2. Final version of the 16 items included in the Collegiate Hockey Worry Scale.

## Procedures

Instruments were administered to the hockey players at team meetings scheduled by the coaches. All 178 athletes completed the SCAT, SAS, and CHWS; however, only 102 athletes from five teams (two university and three college teams) completed the SRS. The athletes who responded to the SRS did not complete the scale in its entirety because the time required to complete all 120 paired comparisons in addition to the SCAT, SAS and CHWS would have been excessive. Consequently, the athletes who were administered the SRS only completed half the scale—51 athletes completed the first 60 paired comparisons contained in the inventory and 51 athletes completed the last 60 paired comparisons. After the initial sessions with the teams, 78 athletes from five teams (which were randomly selected) completed the CHWS on a second occasion (within 7 days of initial testing) so that test-retest reliability of the newly developed instrument could be assessed.

With the exception of the SRS, the presentation order of the SCAT, SAS, and CHWS was counterbalanced across subjects. The SRS was always presented to the athletes first because the tester had to provide verbal instructions (in addition to the written instructions contained within the questionnaire) to ensure that all athletes fully understood the paired-comparison protocol (cf. Dunn & Nielsen, 1993).

## Data Analysis

Preliminary analysis: Presentation order effects. Given the similar nature of the three anxiety-response inventories that were presented in the study, it was necessary to check that no inventory presentation order effects had affected athletes' responses. Excluding the SRS (which was always administered first), athletes completed the SCAT, SAS, and CHWS in one of six presentation order formats. Table 3-4 shows the number of athletes who completed each presentation format.

Table 3-4

Frequency of Athletes Completing Each Inventory Presentation-Order Format

| Order | Presentation Format | Number of Athletes | Percentage of Athletes |
|---|---|---|---|
| 1. | SCAT, SAS, CHWS | 32 | (18.0) |
| 2. | SCAT, CHWS, SAS | 30 | (16.9) |
| 3. | SAS, SCAT, CHWS | 31 | (17.4) |
| 4. | SAS, CHWS, SCAT | 26 | (14.6) |
| 5. | CHWS, SCAT, SAS | 30 | (16.9) |
| 6. | CHWS, SAS, SCAT | 29 | (16.3) |
|  | Total | 178 | (100) |

To test the presentation order effect, it was decided to have equal sample sizes in each cell. Consequently, a total of 22 athletes were randomly deleted from the data set so that each presentation order format contained data from 26 respondents. Using the scores from all eight subscales as dependent variables (i.e., four CHWS subscales, three SAS subscales, and the composite SCAT score), a MANOVA was conducted to determine if subscale scores differed systematically as a function of their presentation order. A non-significant multivariate effect was obtained, $T^2 = .333$, $F\ (40, 707) = 1.18$, $p = .21$, indicating the absence of any presentation order effect.

*Competitive trait anxiety measures*. The psychometric properties of both the SCAT and SAS were assessed. Each instrument was factor analysed to determine whether their factoral structures were in accordance with theoretical predictions. It was deemed particularly important to assess the factorial structure of the SAS because (1) there has been very little empirical research that has reported the scale's psychometric properties, and (2) the scale has never been used with a population that is comparable with the male varsity hockey players who participated in this study. In other words, the construct validity of the SAS is unknown for the present sample of athletes. The internal consistency of the scales was assessed with coefficient alpha. The final step in assessing the construct validity of the instrument was conducted by correlating the scores from the two instruments to determine the degree of association between the measures. Since researchers claim that both scales measure competitive trait anxiety, it was hypothesised that significant positive correlation coefficients would be obtained between composite SCAT scores and the three SAS subscales.

*Latent dimensionality of the 16 worry items*. To determine whether athletes recognise and differentiate between various sources of worry in competition, data provided by the 102 athletes who completed the SRS were subjected to a group-level multidimensional scaling (MDS) analysis. It was hypothesised that homogeneous item clusters depicting concerns about physical danger/injury, performance failure, negative social evaluation, and uncertainty would be obtained.

It was noted earlier that 51 athletes completed the first 60 paired comparisons that were presented in the scale, while another 51 athletes completed the remaining 60 paired comparisons. For analytical purposes, rating-scale data from athletes who completed the first 60 paired comparisons were combined with data from athletes who completed the second 60 paired comparisons. Where possible, athletes were matched by team, playing position, and playing experience. Consequently, a total of 51 complete data matrices (each containing 120 paired comparisons) were created and formed the units of analysis for the MDS analysis.

As described in the previous chapter (Dunn, 1994), MDS analyses data that reflect the degree of dissimilarity (or similarity) between two "items" (Young & Harris, 1993). The resulting MDS solution "displays the structure of the distance-like data as a geometric picture" (Young & Harris, 1993, p. 155) in an $n$-dimensional space. Goodness-of-fit indices (Stress and $R^2$ values) are used to select the appropriate dimensionality of the solution. However, model-interpretability generally guides dimensionality selection (cf. Dunn & Nielsen, 1993), with higher dimensional solutions being chosen over lower dimensional solutions only if additional dimensions add to the clarity and interpretability of the Euclidean model (Kruskal & Wish, 1978).

Psychometric properties of the Collegiate Hockey Worry Scale. To further assess the underlying psychological structures associated with cognitive worry, item correlations between the 16 CHWS items were subjected to principal components and principal axes analyses. Resulting factors were rotated and transformed to both orthogonal and oblique solutions. As was the case with the factor analyses conducted on the SCAT and SAS, the sample size in the present study ($N$ = 178) was more than adequate for meeting the minimum subject-to-variable ratio (5:1) recommended by Gorsuch (1983, p. 332) for factor analytic procedures. Solution-interpretability using Thurstone's (1947) principle of simple structure was the main criterion upon which the final factor analytic solutions were chosen. Subscale internal consistencies were calculated using coefficient alpha.

Since the CHWS has never been used in any previous research, it was imperative to establish test-retest reliability for the scale before valid inferences based upon the subscale scores can be made. Reporting questionnaire reliability is strongly recommended so that researchers who wish to adopt the measure for future work can determine whether the "reported reliability 'generalises' to their particular use" (Morrow & Jackson, 1993, p.

352). However, establishing test-retest reliability assumes an even greater role in the construct validation process of a trait-instrument because the scores are expected to remain stable over time, so without test-retest reliability it is impossible to establish validity. Test-retest reliability estimates using the Pearson Product Moment Correlation ($r$) were calculated for each CHWS subscale from the data provided by the 78 athletes who completed the scale on two separate occasions.

Although individual item test-retest reliabilities are seldom reported by the makers of personality inventories, Angleitner, John, and Löhr (1986) strongly recommend that "item stability should be used as an item selection criterion early in [the] scale construction [process]" (p. 97). Consequently, individual item test-retest reliabilities were also calculated using the Pearson Product Moment Correlation.

Relationship between competitive trait anxiety and worry tendencies. To examine whether high and low CTA hockey players differ with respect to the types of worries that they tend to experience, athletes were divided into high and low CTA groups on the basis of their SCAT and SAS scores. High-CTA groups consisted of (approximately) the highest 33% of CTA inventory scorers, and the low-CTA groups consisted of (approximately) the lowest 33% of CTA inventory scorers. Thus, a total of four high-low CTA classifications were established—one for each CTA subscale (i.e., high-low SCAT, high-low SAS-somatic, high-low SAS-worry, and high-low SAS-concentration disruption). Based on these extreme group classifications, four separate multivariate analyses of variance (MANOVA), with CHWS subscale scores as dependent variables, were conducted. To examine between-group differences in worry tendencies, significant multivariate effects were followed by separate univariate analyses of variance (ANOVA) on the CHWS subscales. Power and effect sizes were estimated for univariate comparisons.

Individual athlete-worry profile analyses. In the previous chapter, Dunn (1994) argued that the findings of group-level data analytical techniques are only beneficial to the extent that they apply at the individual level. Given the applied nature of sport psychology in terms of its application to performance enhancement, Dunn's (1994) contention is particularly relevant since the most effective psychological performance enhancement strategies are aimed at the needs of individual athletes, rather than at the needs of the "average" athletes (who arguably do not even exist). Consequently, a number of additional analyses were conducted (including a hierarchical cluster analysis) to demonstrate (1) the heterogeneous nature of worry among high CTA athletes, and (2) to reinforce the need for individual level assessments of factors relating to competitive trait anxiety. Analyses and athlete profiles were based exclusively upon responses to the SCAT (when conceptualised as a unidimensional measure of CTA) and the CHWS.

## Results

### Psychometric Characteristics of the Sport Competition Anxiety Test and Sport Anxiety Scale

Sport Competition Anxiety Test psychometrics. Data for the 10 anxiety-related items in the SCAT were subjected to a principal components analysis. Based on both the Kaiser-Guttman rule of retaining factors with eigenvalues greater than or equal to 1.0, and Cattell's (1978) scree plot criteria (see Figure 3-3), two factors were retained and rotated to an orthogonal solution. The final two-factor solution is shown in Table 3-5. Factor I accounted for nearly 49% of the variance and primarily depicted the somatic dimension of competitive trait anxiety. Factor II accounted for 13% of explained variance and contained two items describing cognitive aspects of CTA. Internal consistency (coefficient alpha) was .87 for Factor I (somatic) and .64 for Factor II (cognitive). Internal consistency for all 10 items was .85.

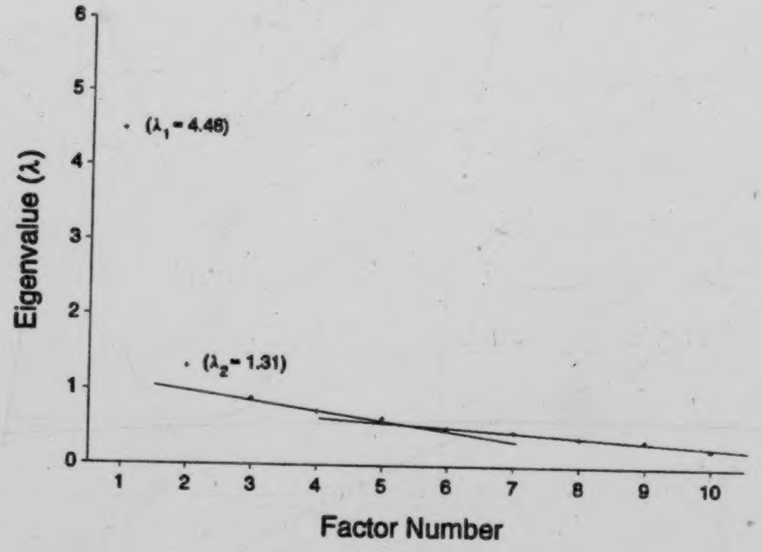

Figure 3-3. Scree plot of eigenvalues obtained from a principal components analysis of the Sport Competition Anxiety Test.

Table 3-5

Principal Components Analysis (Varimax Rotation) of the Sport Competition Anxiety Test

| Item | Abbreviated item description | Factor Loadings I | Factor Loadings II | Communality |
|---|---|---|---|---|
| 2. | Feel uneasy. | **.78** | .10 | .62 |
| 3. | Worry about not performing well. | .20 | **.80** | .68 |
| 5. | Worry about making mistakes. | .06 | **.84** | .72 |
| 6. | I am calm. | **.67** | .23 | .51 |
| 8. | Get queasy feeling in stomach. | **.75** | -.16 | .58 |
| 9. | Heart beats faster than usual. | **.67** | .00 | .45 |
| 11. | Feel relaxed. | **.72** | .25 | .58 |
| 12. | I am nervous. | **.76** | .30 | .67 |
| 14. | Get nervous wanting to start game. | **.60** | .21 | .40 |
| 15. | Get uptight. | **.73** | .27 | .60 |
| Eigenvalue | | 4.48 | 1.31 | |
| Percentage of variance | | 44.8 | 13.1 | |

Note. Factor I = Somatic; Factor II = Cognitive.

In contrast to the findings of a two-factor SCAT solution in this study, very few studies in the sport psychology literature have treated the SCAT as a multidimensional measure of CTA that differentiates between somatic and cognitive anxiety. One notable exception was a study conducted by Lewthwaite (1990) who excluded the two cognitive SCAT items (Items 3 and 5) to create a SCAT-Somatic variable but did not report any factor analytic results relating to her SCAT data. (Lewthwaite also reported composite SCAT scores based on all 10 items). Other than Lewthwaite's (1990) use of the SCAT, sport psychology researchers have overwhelmingly treated the SCAT as a unidimensional instrument by reporting a composite SCAT score based on all 10 items. Indeed, a review of the literature suggests that the predominant practice among researchers who use the SCAT is to forego any factor analytic procedures and to simply report the scale's internal consistency using coefficient alpha. Consequently, the factor structure of the instrument is commonly not assessed and is therefore unknown. Failing to assess a scale's factor structure while relying solely on measures of internal consistency is a dangerous practice for researchers to adopt since the latent factor structure of a scale cannot be inferred from the value of coefficient alpha—stated simply, alpha is not a measure of item homogeneity (Crocker & Algina, 1986; Green, Lissitz, & Mulaik, 1977; McDonald, 1981; Schutz & Gessaroli, 1993). Coefficient alpha provides a measure of the degree to which items in a scale are answered in a similar/consistent manner by respondents. In other words, if all items in a scale are answered in a fairly consistent manner across respondents (resulting in a high level of internal consistency) it is still quite possible that the items comprising the scale do not measure the same latent construct.

Given the preponderance of published research that has used the SCAT as a unidimensional measure of CTA (which was Martens' [1977] original intention), and given that this usage is rarely challenged by professionals in the field of sport psychology, SCAT scores based on responses for all 10 anxiety-related items will be used to reflect athletes' levels of CTA throughout this paper. In so doing, comparisons involving the results of this study with those of previous studies will be facilitated (Lewthwaite, 1990). Potential implications of using the SCAT as a unidimensional measure of CTA will be discussed in more detail later. However, because the principal components solution in this study does suggest a multidimensional structure to the SCAT, where appropriate, composite scores reflecting SCAT-Somatic (8 items) and SCAT-Cognitive (2 items) "subscales" will also be reported.

Sport Anxiety Scale psychometrics. Given the exploratory nature of this study's use of the SAS with a sample of collegiate hockey players, data were subjected to a principal components analysis. The original extraction revealed five factors with eigenvalues greater than 1.0, however, an examination of the scree plot (see Figure 3-4) clearly suggests a three factor solution. Given that the developers of the instrument propose a three factor structure (Smith et al., 1990), and in light of the scree plot, a three-factor solution was chosen to represent the factor structure of the SAS. The three factors were rotated to an orthogonal solution which is shown in Table 3-6.

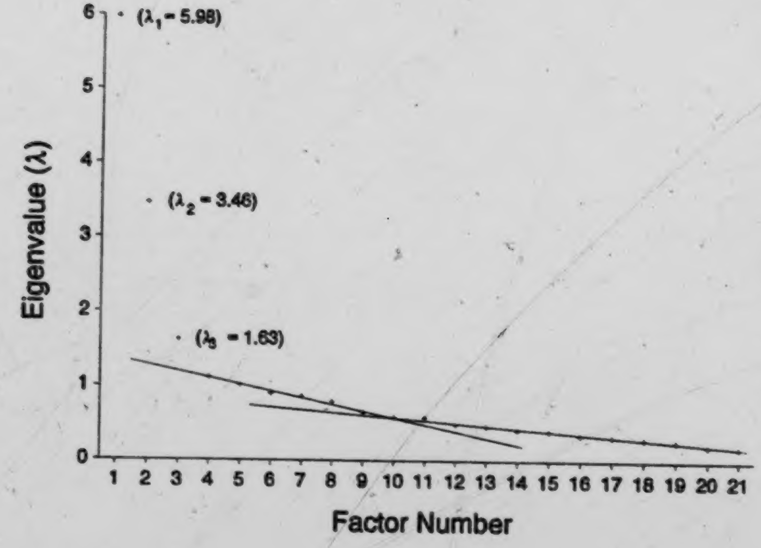

Figure 3-4. Scree plot of eigenvalues obtained from principal components analysis of the Sport Anxiety Scale.

Table 3-6

Principal Components Analysis (Varimax Rotation) of the Sport Anxiety Scale

| | Factor Loadings | | | |
|---|---|---|---|---|
| Abbreviated item description | I | II | III | Communality |
| 1. I feel nervous. | **.70** | .23 | -.14 | .56 |
| 2. Think about unrelated things. | -.12 | .06 | **.89** | .80 |
| 3. I have self-doubts. | .15 | **.61** | .34 | .50 |
| 4. My body feels tense. | **.63** | .20 | .04 | .43 |
| 5. Concerned about doing well. | .13 | **.69** | .06 | .50 |
| 6. My mind wanders. | -.08 | .07 | **.90** | .81 |
| 7. Don't pay attention. | -.06 | .22 | **.47** | .28 |
| 8. Feel tense in my stomach. | **.79** | .00 | -.07 | .63 |
| 9. Thoughts interfere with my concentration. | .11 | **.73** | .09 | .56 |
| 10. Concerned about choking. | .13 | **.73** | .08 | .55 |
| 11. My heart races. | **.71** | .26 | -.17 | .59 |
| 12. Feel my stomach sinking. | **.75** | .12 | .05 | .58 |
| 13. Concerned about performing poorly. | .09 | **.78** | .06 | .62 |
| 14. Have lapses of concentration due to nerves. | .24 | **.55** | .07 | .37 |
| 15. Find myself trembling before competition. | **.54** | .21 | .02 | .33 |
| 16. Worry about reaching my goal. | .07 | **.57** | -.05 | .34 |
| 17. My body feels tight. | **.73** | .09 | .04 | .54 |
| 18. Concerned that others will be disappointed. | .09 | **.71** | .04 | .51 |
| 19. My stomach gets upset. | **.73** | -.01 | .04 | .54 |
| 20. Concerned about concentrating. | .13 | **.55** | .35 | .46 |
| 21. My heart pounds before a game. | **.70** | .09 | -.23 | .56 |
| Eigenvalue | 5.98 | 3.46 | 1.63 | |
| Percentage of variance | 28.5 | 16.5 | 7.7 | |

Note. Factor I = Somatic; Factor II = Cognitive Worry; Factor III = Concentration Disruption.

Factor I (see Table 3-6) consisted of 9 items ($\alpha = .88$) that reflect the Somatic component of CTA. The nine items loading on Factor II ($\alpha = .86$) were associated with Cognitive Worry. Factor III contained three items ($\alpha = .72$) reflecting the Concentration Disruption aspect of CTA proposed by Smith et al. (1990). Similar factor structures were obtained when an oblique transformation was applied to the data (see Appendix G); the resulting low inter-factor correlations further support the retention of an orthogonal SAS solution.

The nine items that load on Factor I (somatic) are identical to the items contained in the SAS-Somatic factor proposed by Smith et al. (1990). However, in contrast to the seven-item Cognitive Worry factor reported by Smith et al. (1990), the present findings reveal a nine-item Cognitive Worry factor. According to Smith et al. (1990), Items 14 ("Have lapses of concentration due to nerves") and 20 ("Concerned about concentrating") are associated with Concentration Disruption A-trait. However, the factor loadings contained in Table 3-6 clearly indicate that for this sample of collegiate hockey players, Items 14 and 20 are more related to the Cognitive Worry component of CTA than the Concentration Disruption component. Indeed, when Items 14 and 20 were included with the three-item Concentration Disruption subscale, the magnitude of coefficient alpha fell from .72 (three-item subscale) to .66 (five-item subscale). Since there is a reduction in the internal consistency of the Concentration Disruption subscale with the inclusion of Items 14 and 20, evidence to refute the membership of the two items in the Concentration Disruption subscale is provided. Given these findings, for the purpose of this study, Items 14 and 20 were included in the SAS Cognitive Worry subscale, and Items 2, 6 and 7 made up the SAS Concentration Disruption subscale.

### Latent Structure of Cognitive Worry

Similarity Rating Scale dimensionality. A weighted MDS analysis (individual differences scaling [INDSCAL]) developed by Carroll and Chang (1970) was used to analyse the SRS data. Given that the athletes who completed the scale received no guidance regarding the use of any specific "psychological constructs" upon which to base their item-similarity ratings, a weighted MDS procedure was employed because it is most appropriate when there is a possibility that different respondents use different "perceptual or cognitive processes" to make their ratings (Young & Harris, 1993, p. 186).

The goodness-of-fit indices for both the two- (Stress = .29; $R^2$ = .62) and three-dimensional solutions (Stress = .27; $R^2$ = .59) were very similar. However, the addition of the third dimension was not useful in adding to the interpretability or clarity of the solution; consequently, a two-dimensional solution was chosen to reflect the latent psychological structure of the 16 worry items. Table 3-7 contains the dimension weights for the items that correspond to the stimulus configuration displayed in Figure 3-5.

Table 3-7

Item Descriptions and Dimension Weights for Two-Dimensional Multidimensional Scaling Solution of 16 Similarity Rating Scale Items

| | | Dimension Weights | |
|---|---|---|---|
| Item | Abbreviated item description | 1 | 2 |
| ***"I worry about..."*** | | | |
| 1. | ...chippy physical hockey. | 1.11 | 1.12 |
| 2. | ...what my teammates will think. | -1.08 | 0.34 |
| 3. | ...making mistakes. | -1.00 | -0.34 |
| 4. | ...other people being disappointed with me. | -1.03 | 0.66 |
| 5. | ...not knowing the opposing players. | 1.04 | -1.04 |
| 6. | ...physical bad-tempered games. | 1.13 | 1.08 |
| 7. | ...how the coach will view my performance. | -1.07 | 0.66 |
| 8. | ...playing poorly. | -1.03 | -0.29 |
| 9. | ...what to expect from the opposition. | 0.88 | -1.41 |
| 10. | ...dirty physical hockey. | 1.08 | 1.20 |
| 11. | ...not knowing how the will opposition play. | 0.92 | -1.21 |
| 12. | ...dirty stick work. | 1.08 | 1.26 |
| 13. | ...spectators forming a poor impression of me. | -0.97 | 1.02 |
| 14. | ...not being ready or psyched up for the game. | -0.72 | -1.28 |
| 15. | ...not knowing what to expect in game. | 0.68 | -1.43 |
| 16. | ...not performing to the best of my ability. | -1.04 | -0.34 |

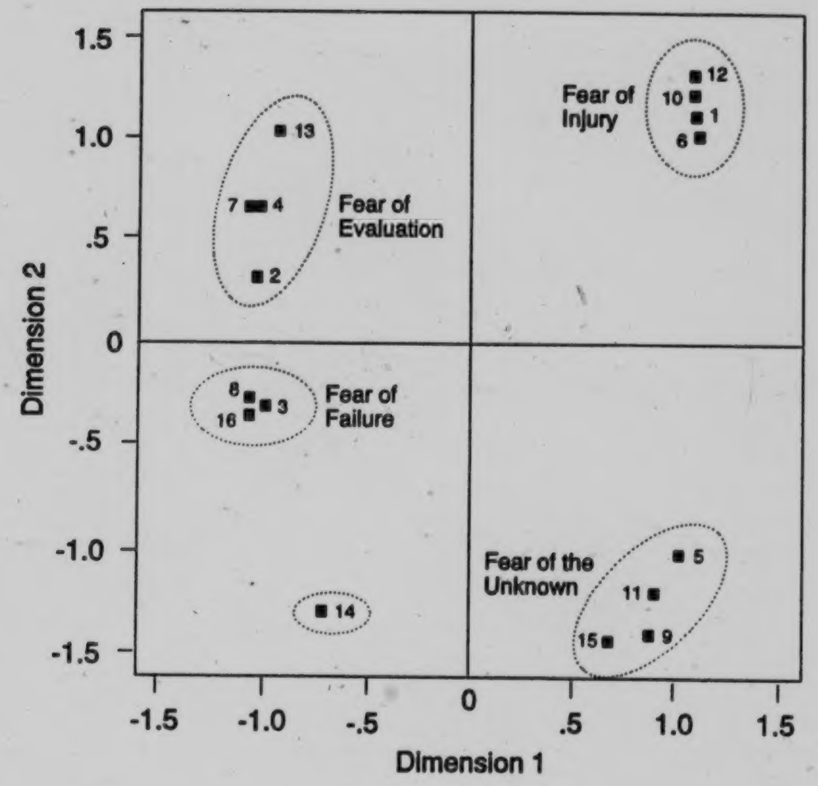

Figure 3-5. Two-dimensional stimulus configuration of 16 Similarity Rating Scale items.

With the exception of Item 14 (I worry about not being ready or psyched up for the game), the results of the MDS analysis provide four distinct and interpretable item-clusters. In accordance with theoretical predictions, Items 1, 6, 10 and 12 formed a cluster reflecting athletes' worries about potential injury and physical danger. The cluster containing Items 5, 9, 11, and 15 clearly reflected athletes' worries about unknown or uncertain situational characteristics. Items 3, 8 and 16 formed an extremely tight homogeneous cluster depicting athletes' worries about potential performance failures. The fourth cluster, though somewhat less tightly-grouped than the first three clusters, consisted of the four items (2, 4, 7, and 13) that measured athletes' worries about negative social evaluation.

During the item-development phase of this study, Item 14 was originally designed to measure athletes' worries about performance failure; however, its distance from the "Fear of Failure" cluster in Figure 3-5 clearly indicates that the athletes did not associate Item 14 with the same performance failure characteristics contained in Items 3, 8, and 16. Potential reasons to explain the location of Item 14 in the MDS solution are addressed in detail later.

The MDS analysis of the SRS data was conducted for two purposes: (1) to assess the viability of adopting a multidimensional model of cognitive A-trait in anxiety research, and (2) to assist with the construct validation of the CHWS. On the basis of the SRS data, Item 14 does not appear to be directly measuring one of the four psychological worry constructs that the study originally intended to examine; consequently, the inclusion of Item 14 in the "fear of failure" subscale of the CHWS is seriously questioned. Given that Item 14 may have to be removed from the CHWS, a decision was made to re-run the MDS analysis with Item 14 excluded from the SRS data set. The results of this analysis are displayed in Table 3-8 and Figure 3-6.

With the removal of Item 14, a two-dimensional solution was again chosen to reflect the latent dimensionality of the data (Stress = .30; $R^2 = .65$). All four clusters depicting fear of injury/physical danger (Items 1, 6, 10, and 12), fear of the unknown (Items 5, 9, 11, and 15), fear of failure (Items 3, 8, and 16) and fear of negative social evaluation (Items 2, 4, 7, and 13) were replicated. The only obvious difference between the new solution (Figure 3-6) and the original solution (Figure 3-5) was the reduction in the variability of distances between items within the fear of negative social evaluation cluster in the new solution (see Figure 3-6).

Table 3-8

Item Descriptions and Dimension Weights for Two-Dimensional Multidimensional Scaling Solution of Similarity Rating Scale Items With Item 14 Removed From the Data Set

| | | Dimension Weights | |
|---|---|---|---|
| Item | Abbreviated item description | 1 | 2 |
| ***"I worry about..."*** | | | |
| 1. | ...chippy physical hockey. | 1.04 | 1.23 |
| 2. | ...what my teammates will think. | -1.09 | 0.18 |
| 3. | ...making mistakes. | -1.01 | -0.41 |
| 4. | ...other people being disappointed with me. | -1.08 | 0.44 |
| 5. | ...not knowing the opposing players. | 0.97 | -1.16 |
| 6. | ...physical bad-tempered games. | 1.05 | 1.15 |
| 7. | ...how the coach will view my performance. | -1.12 | 0.26 |
| 8. | ...playing poorly. | -1.05 | -0.25 |
| 9. | ...what to expect from the opposition. | 0.82 | -1.53 |
| 10. | ...dirty physical hockey. | 1.02 | 1.27 |
| 11. | ...not knowing how the will opposition play. | 0.86 | -1.34 |
| 12. | ...dirty stick work. | 1.01 | 1.35 |
| 13. | ...spectators forming a poor impression of me. | -1.06 | 0.61 |
| 15. | ...not knowing what to expect in game. | 0.68 | -1.51 |
| 16. | ...not performing to the best of my ability. | -1.05 | -0.30 |

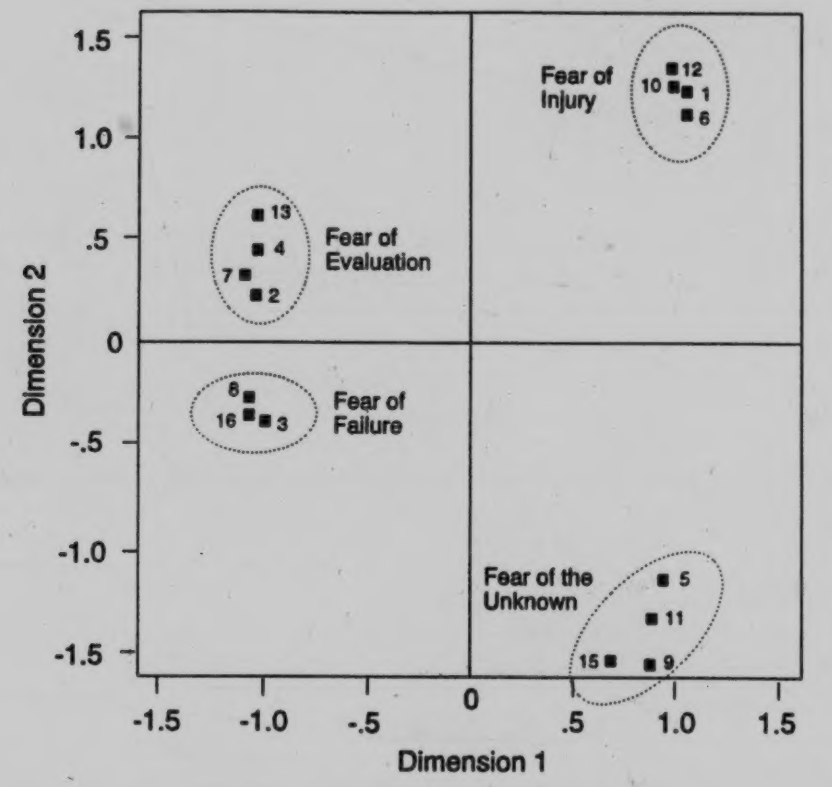

Figure 3-6. Two-dimensional stimulus configuration of Similarity Rating Scale data with Item 14 removed from the data set.

Collegiate Hockey Worry Scale psychometrics. The Collegiate Hockey Worry Scale data were subjected to both principal components and principal axes analyses. Three eigenvalues greater than 1.0 were obtained, and the resulting scree plot (see Figure 3-7) also suggested the retention of three factors. Consequently, a three factor solution was chosen to represent the factor structure of the CHWS data.

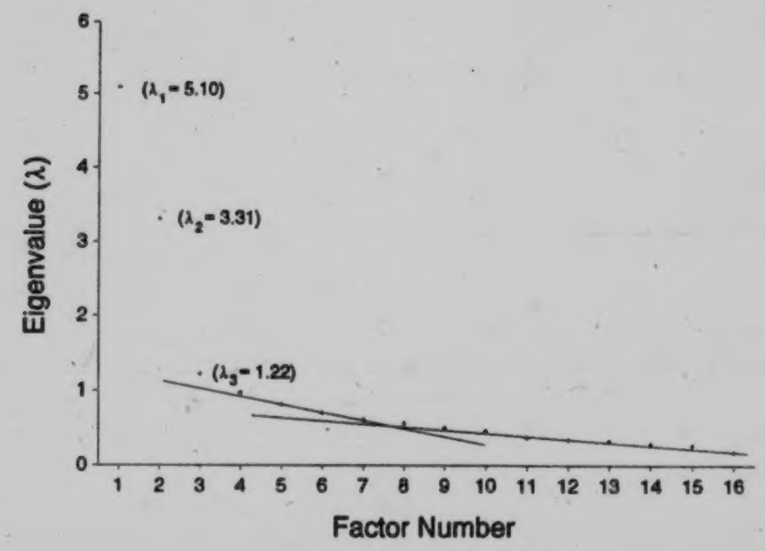

Figure 3-7. Scree plot of eigenvalues obtained from a principal axes analysis of the Collegiate Hockey Worry Scale.

An examination of the residual correlation matrixes (RCMs) resulting from both extraction procedures indicated that the principal axes procedure provided a much better solution.[2] Specifically, the RCM for the principal axes extraction contained 17 residuals (14%) with absolute values greater than .05, and only 3 residuals (2.5%) with absolute values greater than .10. In contrast, the RCM for the principal components solution contained 52 residuals (43.3%) with absolute values greater than .05, and 15 residuals (12.5%) with absolute values greater than .10. Given these findings, the factor loadings from the principal axes analysis were rotated to an orthogonal solution (using Varimax rotation) and to an oblique solution (using direct oblimin transformations). Using Thurstone's (1947) principal of simple structure, an oblique solution derived from a direct oblimin transformation (see Gorsuch, 1983, pp. 188-190) was chosen to represent the factor structure of the CHWS data (see Table 3-9).

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[2] The RCM contains values for the differences between item correlations in the original correlation matrix and the item correlations in the reproduced correlation matrix.

Table 3-9

Pattern Coefficients From Principal Axes Analysis (Direct Oblimin Transformation: Delta = -1.0) of the Collegiate Hockey Worry Scale

| | | Pattern Coefficients | | |
|---|---|---|---|---|
| Item | Abbreviated item description | I | II | III |
| ***"I worry about..."*** | | | | |
| 1. | ...chippy physical hockey. | **.76** | .02 | .06 |
| 2. | ...what my teammates will think. | .03 | **.58** | .04 |
| 3. | ...making mistakes. | .08 | **.72** | -.12 |
| 4. | ...other people being disappointed with me. | -.03 | **.76** | .03 |
| 5. | ...not knowing the opposing players. | .07 | -.08 | **.74** |
| 6. | ...physical bad-tempered games. | **.68** | .02 | .15 |
| 7. | ...how the coach will view my performance. | -.10 | **.73** | -.10 |
| 8. | ...playing poorly. | .00 | **.74** | .03 |
| 9. | ...what to expect from the opposition. | .26 | .02 | **.54** |
| 10. | ...dirty physical hockey. | **.93** | .05 | -.01 |
| 11. | ...not knowing how the will opposition play. | .22 | -.07 | **.72** |
| 12. | ...dirty stick work. | **.72** | .02 | .21 |
| 13. | ...spectators forming a poor impression of me. | .13 | **.57** | .11 |
| 14. | ...not being ready or psyched up for the game. | -.01 | .17 | **.33** |
| 15. | ...not knowing what to expect in game. | .13 | .13 | **.50** |
| 16. | ...not performing to the best of my ability. | .01 | **.56** | .15 |

Note. Factor I = Fear of Injury/Physical Danger; Factor II = Fear of Negative Social Evaluation/Failure; Factor III = Fear of the Unknown.

[a] $r_{I.II} = .09$; $r_{I.III} = .44$; $r_{II.III} = .18$.

The four items (1, 6, 10, and 12) that loaded on Factor I all described athletes' worries about potential injury and physical danger. Seven items describing worries about negative social evaluation (Items 2, 4, 7, and 13) and performance failure (Items 3, 8, and 16) loaded on Factor II. Five items loaded on the third factor, however, with the exception of Item 14 (Worry about not being ready or psyched up for the game), the four remaining items (5, 9, 11, and 15) described athletes' worries about unknown or uncertain aspects of competition. All three CHWS factors/subscales had acceptable levels of internal consistency: Factor I, $\alpha = .89$; Factor II, $\alpha = .85$; and Factor III, $\alpha = .76$.

Given the relatively small value of the pattern coefficient for Item 14 on Factor III, and taking into consideration the location of Item 14 in the MDS solution (see Figure 3-5), the suitability of Item 14 for inclusion in the CHWS is questionable. Indeed, when the item was removed from Factor III for the purpose of assessing subscale internal consistency, coefficient alpha increased from .76 to .80. In view of these findings, it was decided to exclude Item 14 from all further analyses relating to the CHWS. Consequently, the CHWS data were re-analysed with Item 14 removed from the data set.

With Item 14 removed, a three factor solution was again chosen on the basis of the Kaiser-Guttman rule (i.e., three eigenvalues greater than 1.0) and Cattell's (1978) scree plot criteria (see Figure 3-8). A principal axes solution was chosen because it provided a much better reproduced correlation matrix (14 residuals [13%] with absolute values greater than 0.05) than the RCM provided by the principal components analysis (36 residuals [34%] with absolute values greater than 0.05). Using the principle of simple structure, the pattern matrix (see Table 3-10) from a direct covarimin transformation was adjudged to provide the best representation of the data. All 15 items loaded on the same three factors that were derived from the principal axes analysis when Item 14 was included in the data set.

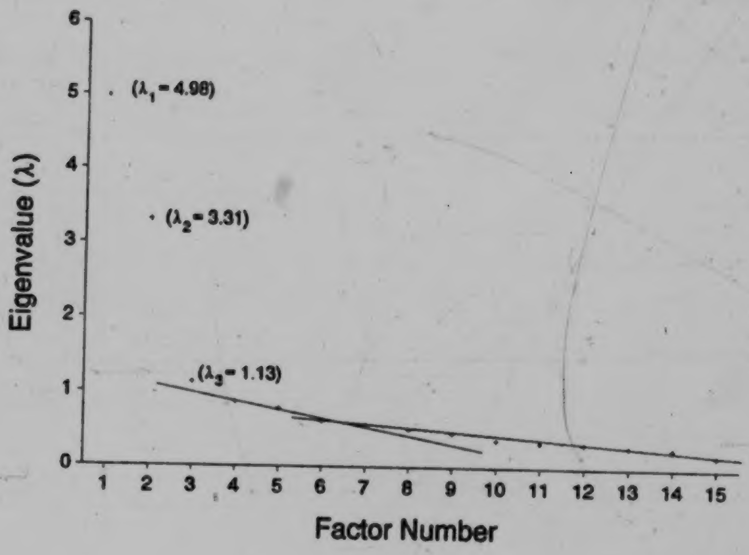

Figure 3-8. Scree plot of eigenvalues obtained from a principal axes analysis of the Collegiate Hockey Worry Scale with Item 14 removed from the data set.

Table 3-10

Pattern Coefficients From Principal Axes Analysis (Direct Oblimin Transformation: Delta = -1.0) of the Collegiate Hockey Worry Scale With Item 14 Removed From the Data Set

| | | Pattern Coefficients [a] | | |
|---|---|---|---|---|
| Item | Abbreviated item description | I | II | III |
| ***"I worry about..."*** | | | | |
| 1. | ...chippy physical hockey. | **.74** | .02 | .09 |
| 2. | ...what my teammates will think. | .00 | **.59** | .07 |
| 3. | ...making mistakes. | .08 | **.71** | -.12 |
| 4. | ...other people being disappointed with me. | -.04 | **.77** | .03 |
| 5. | ...not knowing the opposing players. | .00 | -.04 | **.80** |
| 6. | ...physical bad-tempered games. | **.66** | .02 | .16 |
| 7. | ...how the coach will view my performance. | -.10 | **.73** | -.10 |
| 8. | ...playing poorly. | .01 | **.74** | .00 |
| 9. | ...what to expect from the opposition. | .22 | .05 | **.55** |
| 10. | ...dirty physical hockey. | **.92** | .04 | .00 |
| 11. | ...not knowing how the will opposition play. | .20 | -.02 | **.69** |
| 12. | ...dirty stick work. | **.71** | .03 | .21 |
| 13. | ...spectators forming a poor impression of me. | .11 | **.58** | .12 |
| 15. | ...not knowing what to expect in game. | .10 | .16 | **.51** |
| 16. | ...not performing to the best of my ability. | .04 | **.56** | .09 |

Note. Factor I = Fear of Injury/Physical Danger; Factor II = Fear of Negative Social Evaluation/Failure; Factor III = Fear of the Unknown.

[a] $r_{I.II} = .11$; $r_{I.III} = .47$; $r_{II.III} = .13$.

Comparing the solutions resulting from both the factor analytic and MDS analyses, it is obvious that the two procedures provide different solutions with respect to the underlying psychological dimensionality of the 15 worry items developed in this study. Specifically, the factor analytic results suggest a 3-component model that combines items relating to the fear of negative social evaluation and the fear of performance failure into a single factor. In contrast, the MDS solution provides a 4-component model that separates worries about negative social evaluation and performance failure into two distinct constructs. Although the implications of these findings will be discussed later, for the remainder of this paper, all subsequent analyses involving CHWS responses were conducted on both the 3-component and 4-component models.

Using the data provided by the athletes ($n = 78$) who completed the CHWS on two separate occasions, test-retest reliabilities ($r$) for the composite scores of each CHWS subscale were calculated. All CHWS subscales achieved acceptable levels of test-retest reliability: Fear of Injury/Physical Danger (Items 1, 6, 10, and 12), $r = .90$; Fear of the Unknown/Situational Uncertainty (Items 5, 9, 11, & 15), $r = .74$; Fear of Negative Social Evaluation (Items 2, 4, 7, & 13), $r = .84$; Fear of Failure (Items 3, 8, and 16), $r = .77$; Fear of Negative Social Evaluation/Performance Failure (Items 2, 3, 4, 7, 8, 13, & 16), $r = .86$. On the basis of the psychometric assessment of the CHWS, it is concluded that the scale possesses acceptable psychometric properties that permit further use of its data for inferential and generalizability purposes.

## Relationship Between Sport Competition Anxiety Test, Sport Anxiety Scale, and Collegiate Hockey Worry Scale Scores

Correlations between all scales measuring different aspects of competitive A-trait were calculated. Table 3-11 contains the means, standard deviations, internal consistencies, and inter-scale correlations for all subscales employed in the study. Since the majority of discussion regarding the SCAT in this section is directed at the instrument's unidimensional assessment of CTA, inter-scale correlations with the SCAT-Somatic and SCAT-Cognitive subscales are contained in Appendix H.

Table 3-11

Means, Standard Deviations, Internal Consistencies (Coefficient Alpha) and Correlations (r) Between Sport Competition Anxiety Test (SCAT), Sport Anxiety Scale (SAS) Subscales, and Collegiate Hockey Worry Scale (CHWS) Subscales

| | SCAT | SAS Somatic | SAS Worry | SAS Con. Dis. | CHWS Injury | CHWS Unknown | CHWS Failure | CHWS Evaluation | CHWS Eval/Fail |
|---|---|---|---|---|---|---|---|---|---|
| | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) |
| | 21.16 (4.58) | 18.68 (5.54) | 20.72 (5.38) | 5.62 (1.95) | 8.30 (3.62) | 8.43 (3.28) | 10.90 (2.71) | 13.29 (3.71) | 24.20 (5.86) |
| SCAT | α = .85 | .77*** | .40*** | -.12$^{ns}$ | .16* | .21** | .42*** | .28*** | .37*** |
| SAS Somatic | | α = .88 | .34*** | -.13$^{ns}$ | .16$^{ns}$ | .22** | .29*** | .22** | .27*** |
| SAS Worry | | | α = .86 | .25** | .20** | .24** | .67*** | .60*** | .69*** |
| SAS Con. Dis. | | | | α = .72 | .20** | .08$^{ns}$ | .08$^{ns}$ | .11$^{ns}$ | .11$^{ns}$ |
| CHWS Injury [a] | | | | | α = .89 | .60*** | .16* | .14$^{ns}$ | .16* |
| CHWS Unknown [a] | | | | | | α = .80 | .17* | .17* | .19* |
| CHWS Failure [a] | | | | | | | α = .76 | .66*** | .88*** |
| CHWS Evaluation | | | | | | | | α = .78 | .94*** |
| CHWS Eval/Fail [b] | | | | | | | | | α = .85 |

Note. Correlations are displayed in upper triangular matrix. Scale internal consistency coefficients (α) are displayed in main diagonal.

[a] CHWS subscales are based on item-clusters derived from the multidimensional scaling analysis. [b] CHWS Eval/Fail subscale is based on the factor analytic solution and is a composite of the CHWS Social Evaluation and CHWS Performance Failure dimensions.

$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$. $^{ns}$ Non-significant.

The SAS-Somatic subscale had the largest correlation ($r = .77$) with the SCAT providing additional evidence to suggest that the SCAT primarily measures the somatic aspect of CTA. However, the magnitude of the correlation between the SAS-Somatic subscale and the SCAT-Somatic subscale was only slightly larger ($r = .78$: see Appendix H). The correlation between the SAS-Worry subscale and the SCAT ($r = .40$) was also significant ($p < .001$) indicating that the SCAT, although containing only two cognitively oriented items (Items 3 and 5: see Table 3-5), does provide a reasonable measure of cognitive worry CTA (as defined by the content of the items in the SAS). The SAS Concentration Disruption subscale was unrelated to the SCAT.

All CHWS subscales were significantly correlated with the SCAT, although the correlation between the SCAT and the CHWS-Injury subscale ($r = .16$) was low ($p = .03$). Both the fear of negative social evaluation ($r = .60$) and fear of failure ($r = .67$) subscales had moderately strong correlations with the SAS-Worry subscale, while the fear of the unknown and fear of injury/physical danger subscales had relatively low positive correlations with the SAS-Worry subscale ($r = .24$ and $r = .20$ respectively). These results indicate that the items contained within the Cognitive Worry subscale of the SAS primarily assess the evaluative and performance failure aspects of competitive worries for the sample of hockey players in this study.

### Collegiate Hockey Worry Scale Item Response Characteristics

Individual item test-retest reliabilities ($r$) for the 15 CHWS items are displayed in Table 3-12 together with the mean and standard deviation worry scores for each item. Based on the magnitude of the test-retest coefficients, all items demonstrate a reasonable level of test-retest stability. An examination of the mean item scores at time 1 ($N = 178$) and time 2 ($N = 78$) reveals that, on average, athletes were more inclined to worry about performance failure and negative social evaluation before the start of competition than worry about aspects of their sport relating to situational uncertainties and potential injury. Indeed, all seven items associated with performance failure (Items 3, 8, and 16) and negative social evaluation (Items 2, 4, 7, and 13) received higher mean worry-tendency scores than the remaining eight CHWS items on both testing occasions (see mean-ranks in Table 3-12).

Table 3-12

Descriptive Statistics, Mean-Ranks and Test-Retest Reliabilities for Collegiate Hockey Worry Scale Item Responses

| | | Item Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Time 1 $^a$ | | | Time 2 $^b$ | | | |
| Item | Abbreviated item description | M | (SD) | *Rank* | M | (SD) | *Rank* | RR |
| ***"I worry about..."*** | | | | | | | | |
| 1. | ...chippy physical hockey. | 2.13 | (1.03) | *10* | 2.03 | (1.01) | *9* | .75 |
| 2. | ...what my teammates will think. | 3.30 | (1.19) | *5* | 3.45 | (0.96) | *4* | .74 |
| 3. | ...making mistakes. | 3.43 | (1.17) | *4* | 3.41 | (1.12) | *5* | .71 |
| 4. | ...others being disappointed with me. | 3.27 | (1.21) | *6* | 3.12 | (1.11) | *6* | .68 |
| 5. | ...not knowing the opposing players. | 2.04 | (1.08) | *13* | 1.83 | (0.90) | *15* | .54 |
| 6. | ...physical bad-tempered games. | 1.93 | (1.03) | *15* | 1.90 | (0.96) | *13* | .80 |
| 7. | ...how coach views my performance. | 3.60 | (1.14) | *2* | 3.67 | (0.98) | *1* | .70 |
| 8. | ...playing poorly. | 3.58 | (1.12) | *3* | 3.54 | (1.14) | *3* | .60 |
| 9. | ...what to expect from opposition. | 2.12 | (1.08) | *11* | 1.86 | (0.88) | *14* | .71 |
| 10. | ...dirty physical hockey. | 2.16 | (1.09) | *9* | 1.92 | (0.96) | *11* | .74 |
| 11. | ...not knowing how opposition plays. | 1.98 | (0.94) | *14* | 1.91 | (0.86) | *12* | .54 |
| 12. | ...dirty stick work. | 2.08 | (1.01) | *12* | 1.97 | (0.98) | *10* | .70 |
| 13. | ...spectators impression of me. | 3.12 | (1.23) | *7* | 2.92 | (1.09) | *7* | .66 |
| 15. | ...not knowing what to expect in game. | 2.29 | (1.04) | *8* | 2.17 | (1.01) | *8* | .62 |
| 16. | ...not performing to best of my ability. | 3.90 | (1.01) | *1* | 3.65 | (1.03) | *2* | .72 |

Note. RR Abbreviation = Item Test-Retest Reliability (r)

$^a$N = 178. $^b$N = 78

The rank order of the mean worry-tendency responses associated with the CHWS items supports the writings of Martens, Burton et al. (1990) who propose that cognitive anxiety in sport "is most commonly manifested in negative expectations about performance" (p. 120). The validity of this statement was examined on statistical grounds using the CHWS response data.

Mean subscale item ratings for each of the four CHWS dimensions were calculated (see Table 3-13). Using the mean fear of failure subscale item score as an example, the following is a description of how the scores contained in Table 3-13 were calculated. First, the mean subscale item rating for the fear of failure dimension was calculated by summing the scores for the three items (Items 3, 8, and 16) contained in the subscale. Each athlete's composite subscale score was then divided by the number of items in the subscale (i.e., three). These newly created mean subscale scores were summed across all athletes and then divided by the number of athletes in the sample (N = 178) to provide the score (M = 3.63) shown in Table 3-13. (Although not reported in Table 3-13, the mean subscale item rating for the combined evaluation/failure construct was 3.46 [SD = .84]).

Table 3-13

Mean Item Scores for Collegiate Hockey Worry Scale (CHWS) Subscales

| CHWS Subscale [a] | No. Items in Subscale | Subscale Item Score M | Subscale Item Score (SD) |
|---|---|---|---|
| Fear of Failure | 3 | 3.63 | (0.90) |
| Fear of Negative Social Evaluation | 4 | 3.32 | (0.93) |
| Fear of the Unknown | 4 | 2.11 | (0.82) |
| Fear of Injury | 4 | 2.07 | (0.90) |

Note. All subscales are based on item-clusters derived from the MDS analysis of the SRS data.

Using the mean subscale scores contained in Table 3-13 as dependent variables, a repeated measures ANOVA was conducted to determine whether there were significant differences between worry-tendency levels for the four CHWS subscales. A significant multivariate test of significance ($T^2 = 2.07$, $F$ [3, 173] = 120.97, $p < .001$) led to the rejection of the hypothesis of no differences between worry-tendency scores on the four CHWS subscales. To determine where differences in subscale scores existed, follow up multiple dependent $t$-tests employing the Bonferroni correction to keep overall per-comparison $\alpha$-rates under control were employed (Stevens, 1992). Given the exploratory post-hoc nature of the multiple dependent $t$-test analyses, a conservative per-comparison $\alpha$-level of .01 was set to minimise the risk of falsely rejecting the null hypothesis. Employing the Bonferroni correction procedure described in Stevens (1992, p. 454), each dependent $t$-test was conducted at the .001 level of significance, thereby keeping the overall $\alpha$ below .01. Results of the analyses are contained in Table 3-14.

Table 3-14

Multiple Comparisons (Dependent $t$-tests) of Collegiate Hockey Worry Scale Mean Subscale Item Ratings

| Mean Subscale Item-Rating Comparisons | Mean Difference | Dependent $t$ (df = 177) | Effect Size [a] |
|---|---|---|---|
| $M_{\text{Failure}} - M_{\text{Evaluation}}$ | 0.31 | 5.48*** | 0.41 |
| $M_{\text{Failure}} - M_{\text{Unknown}}$ | 1.52 | 18.28*** | 1.37 |
| $M_{\text{Failure}} - M_{\text{Injury}}$ | 1.56 | 17.71*** | 1.33 |
| $M_{\text{Evaluation}} - M_{\text{Unknown}}$ | 1.21 | 14.36*** | 1.07 |
| $M_{\text{Evaluation}} - M_{\text{Injury}}$ | 1.25 | 13.90*** | 1.04 |
| $M_{\text{Unknown}} - M_{\text{Injury}}$ | 0.04 | 0.58 n.s. | 0.05 |

[a] Effect size was calculated using Cohen's (1977) effect size index for dependent means.
*** $p < .001$. n.s. = Non significant.

Worry-tendency scores associated with the fear of failure subscale were significantly higher than all other CHWS subscales. On average, athletes also reported a greater tendency to experience negative social evaluation worries than to experience worries about injury and situational uncertainty. No statistically significant difference was found between the scores for the CHWS injury and unknown/uncertainty subscales.

## Collegiate Hockey Worry Scale Response Differences Between High and Low Competitive Trait Anxious Athletes

Extreme groups analyses. To create extreme groups for the four CTA measures (i.e., SCAT, SAS-Somatic, SAS-Worry, and SAS-Concentration Disruption), athletes were classified into high- and low-CTA groups (with equal sample sizes) on the basis of their rank-ordered scores using the following criteria: (1) high and low SCAT: top and bottom 32% ($n$ = 57) of scorers respectively, (2) high and low SAS-Somatic: top and bottom 33.7% ($n$ = 60), (3) high and low SAS-Worry: top and bottom 32% ($n$ = 57), (4) high and low SAS-Concentration Disruption: top and bottom 29.2% ($n$ = 52). Using composite scores from each of the four CHWS subscales as dependent variables, four separate MANOVAs were conducted to determine if high- versus low-CTA hockey players differed with respect to their tendency for worrying about different types of situational threat before the start of competition. Significant multivariate effects were followed up by univariate F-tests. Effect sizes and power estimates were also calculated in conjunction with each univariate test. Results of the extreme group analyses for the SCAT, SAS-Somatic, SAS-Worry, and SAS-Concentrate Disruption measures of CTA are displayed in Tables 3-15, 3-16, 3-17, and 3-18, respectively. (Results of the same analyses when the fear of failure and fear of negative social evaluation scores were combined into a single CHWS subscale are displayed in Appendices I through L).

Table 3-15

Summary Statistics for Multivariate and Univariate Planned Comparisons Between High and Low Sport Competition Anxiety Tests (SCAT) Scorers on Four Collegiate Hockey Worry Scale (CHWS) Dimensions

|  | Competitive A-Trait Grouping |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|
| CHWS | High SCAT [a] |  | Low SCAT [b] |  | Multivariate Statistics |  | Univariate Statistics |  |  |
| Dimensions | M | (SD) | M | (SD) | $T^2$ | F (4,109) | F (1,112) | Effect Size [c] | Power |
|  |  |  |  |  | .347 | 9.46*** |  |  |  |
| Injury | 9.09 | (3.91) | 7.21 | (3.09) |  |  | 8.08** | .53 | .80 |
| Unknown | 9.21 | (3.54) | 7.40 | (2.90) |  |  | 8.90** | .56 | .84 |
| Soc. Evaluation | 14.02 | (3.70) | 11.61 | (3.69) |  |  | 11.38** | .65 | .92 |
| Failure | 11.98 | (2.43) | 9.40 | (2.56) |  |  | 29.64*** | 1.04 | 1.00 |

Note. CHWS dimensions are based on item-clusters derived from multidimensional scaling analysis of similarity rating scale data.

[a] M = 26.16. [b] M = 15.81. [c] Effect Size = $[(M_{High} - M_{Low})/SD_{pooled}]$ (See Thomas, Salazar, & Landers, 1991).

**p < .01. ***p < .001.

Table 3-16

Summary Statistics for Multivariate and Univariate Planned Comparisons Between High and Low Sport Anxiety Scale (SAS) Somatic A-Trait Subscale Scorers on Four Collegiate Hockey Worry Scale (CHWS) Dimensions

| CHWS | Competitive A-Trait Grouping | | | | Multivariate Statistics | | Univariate Statistics | | |
|---|---|---|---|---|---|---|---|---|---|
| | High Somatic $^a$ | | Low Somatic $^b$ | | | | | | |
| Dimensions | M | (SD) | M | (SD) | $T^2$ | F (4,115) | F (1,118) | Effect Size $^c$ | Power |
| | | | | | .150 | 4.23** | | | |
| Injury | 8.90 | (3.88) | 7.52 | (3.01) | | | 4.76* | .40 | .58 |
| Unknown | 9.25 | (3.48) | 7.37 | (3.00) | | | 10.08** | .58 | .88 |
| Soc. Evaluation | 13.77 | (3.51) | 12.32 | (3.59) | | | 5.00* | .41 | .60 |
| Failure | 11.37 | (2.40) | 9.95 | (2.79) | | | 8.87** | .55 | .84 |

Note. CHWS dimensions are based on item-clusters derived from multidimensional scaling analysis of similarity rating scale data.

$^a$ M = 24.73. $^b$ M = 13.12. $^c$ Effect Size = $[(M_{High} - M_{Low}) / Sd_{pooled}]$.

*p < .05. **p < .01.

Table 3-17

Summary Statistics for Multivariate and Univariate Planned Comparisons Between High and Low Sport Anxiety Scale (SAS) Cognitive Worry A-Trait Subscale Scorers on Four Collegiate Hockey Worry Scale (CHWS) Dimensions

|  | Competitive A-Trait Grouping |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|
| CHWS | High Worry [a] |  | Low Worry [b] |  | Multivariate Statistics |  | Univariate Statistics |  |  |
| Dimensions | M | (SD) | M | (SD) | $T^2$ | F (4,109) | F (1,112) | Effect Size [c] | Power |
|  |  |  |  |  | 1.02 | 27.76*** |  |  |  |
| Injury | 8.98 | (3.57) | 7.14 | (2.92) |  |  | 9.07** | .56 | .85 |
| Unknown | 8.98 | (3.22) | 7.42 | (2.95) |  |  | 7.29** | .50 | .76 |
| Soc. Evaluation | 15.68 | (2.82) | 10.70 | (3.32) |  |  | 74.46*** | 1.62 | 1.00 |
| Failure | 12.93 | (1.98) | 8.86 | (2.61) |  |  | 87.75*** | 1.75 | 1.00 |

Note. CHWS dimensions are based on item-clusters derived from multidimensional scaling analysis of similarity rating scale data.

[a] M = 26.95. [b] M = 14.76. [c] Effect Size = $[(M_{High} - M_{low})/SD_{pooled}]$.

$**p < .01$. $***p < .001$.

Table 3-18

Summary Statistics for Multivariate and Univariate Planned Comparisons Between High and Low Sport Anxiety Scale (SAS) Concentration Disruption (CD) A-Trait Subscale Scorers on Four Collegiate Hockey Worry Scale (CHWS) Dimensions

| | Competitive A-Trait Grouping | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CHWS | High CD [a] | | Low CD [b] | | Multivariate Statistics | | Univariate Statistics | | |
| Dimensions | M | (SD) | M | (SD) | $T^2$ | F (4,99) | F (1,102) | Effect Size [c] | Power |
| | | | | | .098 | 2.42* | | | |
| Injury | 8.81 | (4.08) | 6.81 | (2.57) | | | 8.96** | .59 | .84 |
| Unknown | 8.54 | (3.58) | 7.79 | (2.82) | | | $1.41^{n.s.}$ | .23 | .21 |
| Soc. Evaluation | 13.88 | (3.92) | 13.12 | (3.53) | | | $1.11^{n.s.}$ | .20 | .18 |
| Failure | 11.23 | (2.68) | 10.77 | (2.88) | | | $.71^{n.s.}$ | .17 | .17 |

Note. CHWS dimensions are based on item-clusters derived from multidimensional scaling analysis of similarity rating scale data.

[a] M = 8.01. [b] M = 3.48. [c] Effect Size = $[(M_{High} - M_{low})/SD_{pooled}]$.

*$p \leq .05$. **$p < .01$. $^{n.s.}$ Non-significant.

As shown in Tables 3-15 through 3-18, significant multivariate effects were obtained for each of the four CTA measures. With the exception of the SAS-Concentration Disruption subscale, high and low CTA athletes differed significantly on all four CHWS subscales. On average, worry tendencies regarding fear of injury/physical danger, fear of the unknown, fear of negative social evaluation, and fear of failure were more characteristic of high CTA athletes (as measured by the SCAT, SAS-Somatic, and SAS-Worry scales) than low CTA athletes (all $p$s $< .05$). The only significant difference between the worry tendencies of high and low SAS-Concentration Disruption athletes related to their responses on the CHWS-Injury subscale. High SAS-Concentration Disruption athletes had a greater tendency to worry about potential injury and physical danger aspects of competition than low SAS-Concentration Disruption athletes ($p < .01$).

With the exception of the effect size (ES) associated with the significant differences between high and low SAS-Somatic groups on the CHWS-Injury and CHWS-Social Evaluation subscales (.40 and .41 respectively), all other effect sizes associated with significant univariate $F$-tests were moderate (ES $\geq .50$) or large (ES $\geq .80$). The magnitude of these effect sizes, in combination with the level of statistical significance, suggests that there are meaningful and systematic differences in the situational pre-game worry tendencies of high and low CTA hockey players.

Given that the principal components analysis of the SCAT revealed a two-factor structure to the instrument (i.e., SCAT-Somatic and SCAT-Cognitive), an extreme groups MANOVA was conducted upon the SCAT-Somatic subscale scores. The high SCAT-Somatic group consisted of the top 34.3% of scorers ($n = 61$, $M = 20.97$) and the low SCAT-Somatic group consisted of the bottom 34.3% of scorers ($n = 61$, $M = 12.11$). A significant multivariate effect was obtained, $T^2 = .166$, $F\,(4, 117) = 4.87$, $p < .005$, and follow up univariate $F$-tests revealed significant between group differences on all four CHWS subscales: fear of injury/physical danger, $F\,(41, 120) = 4.60$, $p < .05$; fear of the unknown, $F\,(41, 120) = 4.75$, $p < .05$; fear of negative social evaluation, $F\,(41, 120) = 5.46$, $p < .05$; fear of failure, $F\,(41, 120) = 15.47$, $p < .001$.

No extreme groups MANOVA was conducted using the SCAT-Cognitive subscale scores as indicators of CTA because the subscale consists of only two items, both of which are measured on a 3-point scale. Consequently, there is an extreme restriction in range between the lowest (2.0) and highest (6.0) possible scores that were attained for the scale. The practical utility (and validity) of creating "extreme groups" on the basis of scores with such restricted range was therefore considered minimal.

## Individual Athlete-Worry Profiles of High Competitive Trait Anxious Athletes

Understanding the reasons why athletes experience competitive anxiety is a key concern for sport psychologists; however, as discussed previously, instruments such as the SCAT provide virtually no information about these causes. The results contained in Table 3-15 suggest that, on average, high SCAT scorers are significantly more predisposed to experiencing worry (as measured by all four subscales of the CHWS) than low SCAT scorers. However, it cannot be concluded on the basis of these results that all, or even a large majority, of high SCAT scorers will be characterised by a high predisposition to experience worry on all four CHWS dimensions. To illustrate this point, and to highlight the need for individual level assessments of CTA, an agglomerative hierarchical cluster analysis (Norušis, 1993) was conducted on high CTA athletes ($\underline{n}$ = 30) who received a score of 26 to 30 on the SCAT (maximum attainable SCAT score = 30). "In agglomerative hierarchical clustering, clusters are formed by grouping cases [i.e., athletes] into bigger and bigger clusters until all cases [athletes] are members of a single cluster" (Norušis, 1993, p. 85). Athlete scores from the four CHWS subscales served as the variables upon which cluster membership calculations were conducted. (The reader is referred to Norušis [1992, pp. 83-99] for a detailed discussion of the cluster analysis procedure employed in this study).

The number of resulting clusters was determined by identifying the point on the agglomeration schedule (see Appendix M) at which the magnitude of the difference between two successive coefficients (representing the squared Euclidean distance between two clusters being combined) became disproportionately larger than the difference between all previous coefficients associated with the cluster-linkage process. This point was adjudged to have occurred when the number of clusters representing the data was reduced from five to four. The dendrogram in Figure 3-9 provides a graphical display of the distances between clusters (represented by the horizontal lines) at which clusters were combined throughout the linkage-process. The broken horizontal lines in Figure 3-9 separate the four clusters, and the numbers in the column titled "ID No." represent the coded identification number of the 30 athletes. Table 3-19 displays the mean CHWS subscale scores for athletes in each cluster.

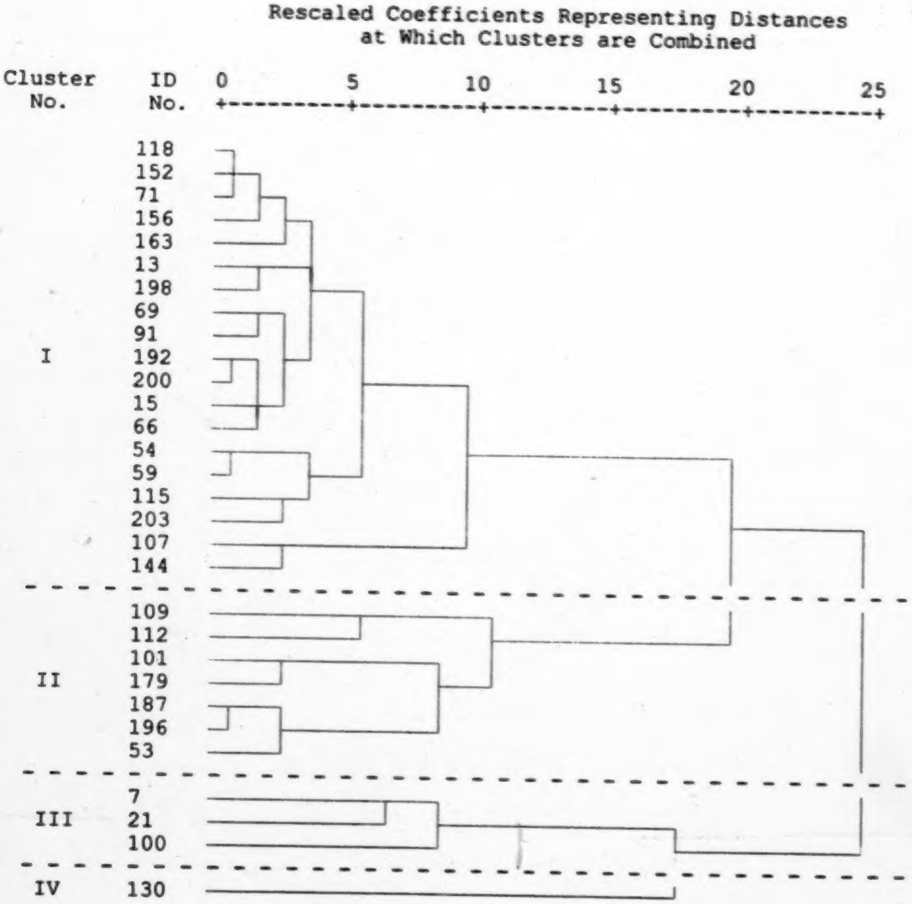

Figure 3-9. Dendrogram of clusters being combined at each step of the agglomerative hierarchical cluster analysis.

Table 3-19

Collegiate Hockey Worry Scale (CHWS) Subscale Score Profiles for Clusters of Athletes Scoring 26 to 30 on the Sport Competition Anxiety Test

| | | CHWS Subscales | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Fear of Injury [a] | | Fear of Unknown [a] | | Fear of Failure [b] | | Fear of Evaluation [a] | |
| Cluster | n [c] | M | (SD) | M | (SD) | M | (SD) | M | (SD) |
| I | 19 | 6.37 | (2.43) | 6.58 | (1.68) | 13.11 | (1.73) | 14.84 | (1.98) |
| II | 7 | 13.43 | (2.99) | 11.86 | (3.24) | 11.86 | (2.27) | 15.57 | (0.53) |
| III | 3 | 12.67 | (3.06) | 11.33 | (2.08) | 11.33 | (2.52) | 6.67 | (2.08) |
| IV | 1 | 5.00 | - | 7.00 | - | 8.00 | - | 6.00 | - |

[a] Number of items in subscale = 4. [b] Number of items in subscale = 3. [c] n = Number of athletes in cluster.

Cluster I contained the largest number of athletes (n = 19) whose worry tendencies were characterised by a low predisposition for worry regarding injury and situational uncertainties, but a fairly high predisposition for worrying about negative social evaluation, and a very high predisposition for worrying about performance failure. Athletes in Cluster II (n = 7) had similar worry tendencies to the athletes in Cluster I regarding negative social evaluation and performance failure. However, the athletes in Cluster II had moderately high predispositions towards worrying about injury/physical danger and situational uncertainties. Athletes in Cluster III (n = 3) had similar worry profiles to the athletes in Cluster II, with the exception of having very low predispositions for worrying about negative social evaluation. Only one athlete was contained in Cluster IV, and he was characterised by having a relatively low predisposition for worrying about all four of the cognitive dimensions assessed by the CHWS. Given that SCAT primarily measures somatic CTA, this athlete may be indicative of players who are predisposed to experiencing many of the somatic symptoms of CTA, while simultaneously experiencing very little cognitive worry.

To further highlight the heterogeneous nature of competitive worry among high CTA athletes (as measured by the SCAT), and to reinforce the need for sport psychologists to conduct individual-level assessments of CTA, worry-profiles for athletes who scored 26 out of 30 on the SCAT ($n = 7$) were created (see Table 3-20). Irrespective of age, playing experience, and playing position, contrasting worry profiles are still evidenced among the seven athletes.

Table 3-20

Demographic Playing Characteristics and Collegiate Hockey Worry Scale (CHWS) Subscale Scores for all Athletes Scoring 26 out of 30 on the Sport Competition Anxiety Test

| | Demographic Characteristics | | | CHWS Subscales | | | |
|---|---|---|---|---|---|---|---|
| I.D. | Age (Years) | Playing Year | Playing Position | Fear of Injury [a] | Fear of Unknown [a] | Fear of Eval. [a] | Fear of Failure [b] |
| | | | | CSS (M) | CSS (M) | CSS (M) | CSS (M) |
| 13 | 19.17 | 1 | Defence | 6 (1.50) | 4 (1.00) | 15 (3.75) | 14 (4.67) |
| 21 | 24.33 | 3 | Defence | 12 (3.00) | 13 (3.25) | 5 (1.25) | 9 (3.00) |
| 109 | 20.67 | 1 | Defence | 19 (4.75) | 11 (2.75) | 16 (4.00) | 12 (4.00) |
| 91 | 25.25 | 3 | Winger | 7 (1.75) | 7 (1.75) | 12 (3.00) | 12 (4.00) |
| 107 | 19.25 | 1 | Winger | 8 (2.00) | 6 (1.50) | 19 (4.75) | 15 (5.00) |
| 112 | 20.58 | 2 | Winger | 15 (3.75) | 8 (2.00) | 15 (3.75) | 15 (5.00) |
| 156 | 22.33 | 1 | Winger | 4 (1.00) | 9 (2.25) | 16 (4.00) | 15 (5.00) |

Note. CSS = composite subscale score; (M) = mean item score in subscale.

[a] Number of items in subscale = 4. [b] Number of items in subscale = 3.

Of particular note, are the contrasting profiles associated with the two athletes identified by I.D. numbers 13 and 109. Despite similarities in age, playing position, playing experience, and SCAT scores, vastly different worry predispositions towards the four dimensions of the CHWS are reported. Consequently, if a sport psychologist was designing psychological skills programs aimed at helping these two athletes cope with anxiety, the content (or direction) of the programs would have to be targeted at quite different aspects of CTA.

## Discussion

One of the major purposes of this study was to determine whether the situational A-trait dimensions contained in Endler's (1983) multidimensional interactional model of anxiety provide a viable framework for assessing cognitive CTA in the sport of ice hockey. These situational A-trait components include physical danger anxiety, performance failure anxiety, negative social evaluation anxiety, and unknown/uncertainty anxiety. Endler theorised that individuals differ in anxiety proneness with respect to different types of situational threats, and suggested that the use of a multidimensional A-trait framework in the assessment of anxiety gives researchers (and practitioners) greater "precision in predicting state anxiety responses and in understanding an individual's pattern of anxiety reactions across situations" (Endler, Edwards, et al., 1991, p. 1). Given these potential benefits, the present study was conducted on the assumption that a multidimensional situational A-trait framework in sport might provide a better understanding of athletes' anxiety responses in competition. The sport of ice hockey was chosen since it appears to contain situational threats that are congruent with the A-trait dimensions in both Endler (1983) and Hackfort's (1986) models of multidimensional trait anxiety (see Dunn, 1994; Dunn & Nielsen, 1993, 1996).

Results of the MDS analysis conducted in this study (see Figure 3-6) revealed four distinct competitive-worry item-clusters that were congruent to the hypothesised physical danger, performance failure, negative social evaluation, and unknown/ uncertainty components of cognitive CTA. This finding suggests that athletes differentiate between competitive worries associated with the four worry-components under investigation and provides initial support for a multidimensional conceptualisation of cognitive CTA in hockey. It is also worth emphasising that the athletes had received no guidance regarding the cognitive-dimensions upon which their paired-similarity ratings were to be based. Consequently, the influence of the researcher's bias for finding four cognitive dimensions was minimised.

Given the considerable body of research that has been conducted upon fear of failure and fear of negative social evaluation in sport (e.g., Gould et al., 1983; Passer, 1983; Rainey & Cunningham, 1988), the emergence of these constructs in this study is not surprising and their important relationship to competitive trait anxiety needs little elaboration. The strength of the positive correlations between fear of failure, fear of negative social evaluation, and the various measures of CTA (i.e., the SCAT and the SAS: see Table 3-11) suggest that the two constructs appear to be key elements associated with CTA (when measured by the SCAT, SAS-Somatic, and SAS-Worry subscales). However, almost no research in the field of sport psychology has been specifically directed at examining the relationship between CTA and the two other worry dimensions that emerged in this study—namely, fear of injury/physical harm and fear of the unknown.

Numerous researchers have noted that athletes do recognise potentially injurious situations as salient sources of threat (Dunn, 1994; Dunn & Nielsen, 1993), competitive stress (Scanlan, Stein, & Ravizza, 1991), and competitive anxiety (Dunn & Nielsen, 1996; Vormbrock, cited in Hackfort & Schwenkmezger, 1989). However, with the exception of Endler's applications of the multidimensional interactional model of anxiety in competitive sport situations (Endler, King, et al., 1985) and motor performance situations (Endler, Crooks, & Parker, 1992), sport psychologists have rarely conceptualised fear of injury/physical harm as a relevant component of CTA. Results of the extreme groups MANOVA analyses conducted in this study (see Tables 3-15 to 3-18) revealed that the high-CTA athletes (when measured by the SCAT and all three subscales of the SAS) were significantly more prone to experiencing worries about physical danger than low-CTA athletes. This finding provides initial evidence that fear of injury/physical danger should possibly be considered a legitimate dimension of CTA. However, it should be noted that the scope (i.e., coverage) of the fear of injury/physical danger dimension developed in this study is relatively narrow; the items primarily described athletes' worries about illegal opponent behaviours during chippy "bad-tempered" games. Future research is required to determine whether other situational aspects of competition regarding the potential for injury are also related to CTA (e.g., playing against bigger, stronger opponents; blocking the puck with the body; chasing the puck into the corner when pressured from behind; fighting).

The fourth worry dimension that emerged in this study—fear of the unknown—was based around Endler's notion that individual differences exist in anxiety proneness to new, unfamiliar, or ambiguous situations where a high degree of uncertainty exists regarding the nature of the situation (Endler, Edwards, et al., 1991). Situational- or outcome-uncertainty has been identified as a key factor contributing to competitive anxiety by numerous researchers (e.g, Fisher & Zwart, 1982; Martens et al., 1990; James & Collins, 1997). Nevertheless, fear of the unknown has generally not been conceptualised as a distinct component of CTA. Similar to the fear of injury results described previously, results of the extreme groups MANOVAs (Tables 3-15, 3-16, and 3-17) provide initial evidence supporting the contention that athletes' fear of the unknown can be considered a relevant CTA dimension. As was also the case with the fear of injury/physical danger construct, the scope of the fear of the unknown dimension has a relatively limited focus. Specifically, the four items contained in the CHWS subscale make specific reference to the unknown characteristics of opponents. Future research is required to determine whether uncertainty about other situational aspects of competition are also associated with CTA in hockey (e.g., playing in a different arena for the first time; travelling with a new team for the first time). Irrespective of the underlying source of uncertainty, coaches and sport psychologists can be most effective in reducing athletes' fears of the unknown by providing as much information as possible ahead of time. In this way, athletes will have a better idea of what to expect when they finally encounter the situation that concerns them (Martens et al., 1990), effectively removing the source of uncertainty.

Although four distinct clusters emerged to represent the "underlying reasons for concern" associated with the worry-items included in this study, the magnitude of the distances between item-clusters provides additional insight into the underlying psychological structure associated with worry in ice hockey. Specifically, the two clusters representing fear of injury/physical danger and fear of the unknown were isolated from each other (in terms of their Euclidean distances) and from the two remaining item-clusters (see Figure 3-6). In contrast, the distance between the centroids of the two clusters representing fear of failure and fear of negative social evaluation was relatively small. The latter observations suggests that athletes may view performance failure and negative social evaluation as separate, yet related, constructs (Hosek & Man, 1989). This finding is not surprising given that negative social evaluation generally results from poor performance; an athlete who performs well during competition is not likely to experience negative social evaluation (either real or perceived).

Additional evidence supporting the potential existence of a multidimensional cognitive CTA construct in hockey was provided by the results from the principal axes analysis of the CHWS response data (Table 3-10) . Instead of finding the same four-component structure to worry established by the MDS analysis, the principal axes analysis revealed a three-factor solution with fear of failure and fear of negative social evaluation items loading on the same factor. However, the observation that the fear of failure and fear of negative social evaluation items load on the same factor does not necessarily mean that they measure the same construct. The unit of analysis for factor analysis is the item correlation matrix, and it is quite possible that items measuring two closely related constructs may be highly correlated. Consequently, if the items are highly correlated, they will most likely load on the same factor following the extraction process. Spielberger (1985) alluded to this problem by stating,

> when only empirical procedures [such as factor analysis] are used...it is often difficult to differentiate between items that measure the same construct, and those that assess related constructs. A combination of rational [e.g., the item content-relevance and SRS procedures used in this study] and empirical procedures is generally more effective for assessing constructs such as anxiety, anger and depression. (p. 9)

Therefore, the single factor representing both the fear of failure and fear of negative social evaluation items, combined with the large positive correlation ($r = .66$) between the CHWS-Failure and CHWS-Evaluation subscales (see Table 3-10), reinforces the previous contention that fear of failure and fear of negative social evaluation are highly related constructs.

Another potential explanation for the close relationship between fear of failure and fear of negative social evaluation may reside in Leary's (1992) self-presentation (or impression management) theory, where self-presentation refers to an individual's concerns regarding the way he or she is viewed by others. Leary (1992, p. 347) stated:

> sport competition anxiety, whether regarded as a state or trait, revolves around the self-presentational implications of competition. Whenever people compete, they run the risk of conveying negative images of themselves—that they are unskilled, incompetent, unfit, unable to handle pressure, or whatever—to observers, teammates, coaches, opposing team members, and often, the world at large.

Although the scope of Leary's (1992) proposed explanation for the causes of competitive sport anxiety is limited (since, for example, it makes no reference to anxiety that may be induced by an athlete's fear of injury/physical danger), implicit within the preceding quotation is the notion that an athlete's desire to be judged favourably by others is largely influenced by the athlete's level of performance during competition. In other words, Leary (1992) appears to suggest that an athlete's fear of failure is part of a larger psychological phenomenon associated with a desire to maintain a high level of self-presentation. In a recent study involving in-depth interviews with 20 male and female athletes from a variety of sports, James and Collins (1997) reported that many competitive performance-failure stressors cited by respondents were actually reflective of self-presentational concerns. For example, when probed about the reasons why performance failure caused anxiety, typical athlete responses included, "All your players look at you and think, 'I can't believe you did that'...they [will] be thinking, 'She's not good enough. She shouldn't be in the team'" (James & Collins, 1997, p. 28). It is therefore not surprising that the fear of failure and fear of negative social evaluation constructs were so closely related in this study when viewed from the explanatory framework provided by self-presentation theory.

Although slightly different solutions were obtained from the MDS and factor analytic procedures, the resulting psychological characteristics associated with the worry dimensions closely resemble the theoretical situational A-trait dimensions proposed by Endler (1983) and Hackfort (1986). This finding is particularly important given that the worry constructs were established upon data from two separate inventories (i.e., the SRS and CHWS) and were analysed with two different analytical procedures (i.e., multidimensional scaling and factor analysis). Specifically, because relatively similar psychological interpretations regarding the nature of worry resulted from both the SRS and CHWS data (and also from the item content-relevance ratings provided by the 36 judges), more confidence can be placed in the conclusion that the proposed dimensionality of cognitive worry is valid, and not simply an artifact of a single measurement technique or data-analytic procedure (i.e., methods-variance contamination is minimised: Pedhazur & Schmelkin, 1991). This type of multi-method multi-analytic design has been recognised as an important part of theory-building research in sport psychology (Feltz, 1989).

On average, athletes reported significantly greater predispostions for worrying about aspects of competition relating to performance failure and negative social evaluation than to aspects concerning physical danger and situational uncertainty (Table 3-14). Of particular interest were the mean-ranks (Table 3-12) associated with worry-tendency scores for Item 7 of the CHWS (I worry about how the coach will view my performance). Item 7 had the second highest mean-worry score ($\underline{M} = 3.60$) among the 15 CHWS items at the initial testing session ($\underline{N} = 178$), and the highest mean-worry score ($\underline{M} = 3.67$) at the re-test session ($\underline{N} = 78$).

Previous research has confirmed that the coach can be a very important factor associated with competitive anxiety (Dunn & Nielsen, 1996) and, in particular, competitive worry (Gould & Weinberg, 1985). However, the athletes who participated in this study and in the studies conducted by Dunn and Nielsen (1996) and Gould and Weinberg (1985) competed in intercollegiate sports, and the nature of the competitive environments in which intercollegiate sports function may have influenced the extent to which the coach was recognised as a source of anxiety. Eklund (1994) compared the content of transcripts from in-depth interviews with intercollegaite wrestlers to the content of transcripts from a different study involving US Olympic team wrestlers (Gould, Eklund, & Jackson, 1992), and observed that concerns about coach evaluations, while prevalent among the college wrestlers, were almost totally absent among

Olympians. Eklund (1994) postulated that once Olympic athletes have made the Olympic team, the decision to compete and represent their country was no longer influenced by the coach. In contrast, the opportunity to compete for intercollegiate athletes resides almost entirely in the hands of the coach. Moreover, the coach's decision to select athletes for competition is generally based upon the athletes' performances. (This may explain why Item 16 [I worry about not performing to the best of my ability] received the highest mean worry-tendency rating at the first test session [M = 3.90] and the second highest mean-rating at the second test session [M = 3.65]). Future research is needed to determine if worries about coach evaluations are indicative of athletes competing at all levels of hockey. For example, in many children's hockey teams the emphasis of competition is primarily on skill development as opposed to winning. Under these conditions, athletes may experience very few worries about potential coach evaluations since all athletes are often given the same amount of playing time, regardless of their levels of performance.

The hockey players who participated in this study were, on average, characterised by a relatively low predisposition for worrying about aspects of competition relating to potential injury and physical danger. It may be postulated that this finding is the result of a "natural selection" process in the sport. By its very nature, hockey is a high contact "collision" sport (Silva, 1983) in which the potential for physical harm is always present to at least some degree. Therefore, most athletes who are concerned about getting hurt or injured may elect to drop out of the sport before ever reaching the age at which they could play intercollegiate hockey. Alternatively, high injury/physical danger CTA athletes may become so pre-occupied with concerns about getting hurt during competition that (1) they adopt a "self protective" style of play that impairs their ability to compete effectively at the highest levels of competition, or (2) their task-irrelevant focus on potential injury (which can be likened to a form of distraction, concentration disruption [see results in Table 3-18], or negative self-talk) has a detrimental effect upon the cognitive processes or task-relevant focus required for the execution of overall skilled performance (cf. Borkovec et al., 1983; Eysenck & Byrne, 1992; Sarason & Sarason, 1987; Smith et al., 1990; Williams & Leffingwell, 1996). Under either of these circumstances, it is unlikely that high injury/physical danger CTA athletes would get the opportunity to play at the intercollegiate level. Future longitudinal-type research may provide a greater understanding of the development and impact of injury/physical danger CTA in the sport.

Although the results of the dependent t-tests contained in Table 3-14 indicate that hockey players are, on average, significantly less prone to experiencing worries about potential injury and physical danger than about aspects of competition relating to performance failure and negative social evaluation, it would be incorrect to infer that this is a characteristic worry-pattern of all athletes who participated in the study. Results of the individual athlete-profile analyses (see Table 3-20) clearly show that some of the hockey players were actually more prone to worrying about potential injury and physical danger than about performance failure and negative social evaluation. This finding reinforces the assertions put forward by Dunn (1994) in the previous chapter that researchers in sport psychology should examine the extent to which results based upon group-level data analytical techniques apply at the individual level. As Bouffard (1993) and others (e.g., Silva, 1984) have pointed out, when analyses are performed on group-mean or aggregate scores, individual differences are often obscured. Moreover, the group mean or aggregate profile may not be representative of individuals' scores on those variables or constructs.

Passer (1983) conducted one of the first studies in sport psychology to identify the aspects of competitive sport that provide salient threats to high CTA athletes. Using an extreme-groups paradigm in which male youth soccer players were classified as high and low CTA on the basis of their respective SCAT scores, Passer (1983) found that high CTA children worried more frequently about aspects of competition relating to fear of failure and fear of negative social evaluation than did low CTA children. The results of the extreme groups analysis conducted in this study (using the SCAT as a measure of CTA) support Passer's (1983) findings (see Table 3-15). However, Passer's (1983) work was based upon a theoretical framework that conceptualised sport as an environment in which the predominant characteristic of threat was related to the "demonstration and evaluation of motor ability" (p. 173). The present study extended the scope of Passer's work by showing that high CTA athletes (as measured by the SCAT) are, on average, significantly more prone to experiencing worries about physical danger and unknown/uncertain aspects of competition than low CTA athletes. Indeed, the magnitude of the effect sizes (range: .53 to 1.04) associated with all four CHWS worry-dimensions (see Table 3-15) suggests that these worry-tendency differences are meaningful.

Results from the extreme groups MANOVAs using SAS-Somatic and SAS-Worry subscale scores as independent variables revealed that high CTA groups were significantly more prone to worrying about all four worry-dimensions contained in the CHWS than low CTA groups (see Tables 3-16 and 3-17). Since competitive A-trait theory predicts that individuals high in CTA will be likely to perceive more aspects of the competitive environment as threatening than low CTA individuals, the results of the extreme groups analyses provide further support for a multidimensional conceptualisation of cognitive worry in sport. However, the fact that extreme groups differences were found on all four CHWS subscales when SCAT and SAS scores were used for extreme group classification purposes highlights a potential limitation of the SCAT and SAS as measures of competitive trait anxiety. Specifically, the SCAT and the SAS assess athletes' proneness for anxiety to "sport in general," but provide very little information about why athletes experience this anxiety (Kroll, 1980) since neither instrument gives consideration to the existence of different situational threats that might reside within the competitive environment being studied (cf. Fisher & Zwart, 1982). Therefore, these instruments should be viewed as providing what might be termed "macro-level" assessments of CTA. Only when the SCAT and SAS subscale scores are examined in conjunction with the CHWS subscale scores is a greater understanding of why athletes experience anxiety attained. For example, without the benefit of the individual athlete-profile analysis that was conducted on the CHWS subscales for athletes scoring 26 out of 30 on the SCAT (see Table 3-20), the researcher has almost no information regarding the situational threats that might be attributing to this level of CTA. Such information could be crucial for coaches and sport psychologists striving to help athletes cope with their anxiety (Passer, 1983). Although the SAS-Worry subscale does provide information about the fear of failure/negative social evaluation aspects of CTA (as reflected in the correlation [$r$ = .69] between the SAS-Worry and CHWS failure/evaluation subscale in Table 3-11), it does not appear to measure any other situational components of cognitive

CTA that may reside within the competitive sport environment (e.g., fear of injury; fear of the unknown).

It should be emphasised that all of results relating to the SCAT discussed to this point were based upon composite 10-item SCAT scores as the measure of CTA. In other words, the SCAT was employed as a unidimensional measure of CTA that did not differentiate between the somatic and cognitive components of anxiety. However, results of the principal components analysis conducted in this study (see Table 3-5) revealed that the SCAT has a multidimensional structure with eight of the ten items loading on a somatic factor and two items loading on a cognitive factor. With respect to this finding, Martens et al. (1990) suggested that the SCAT should be modified so that it "account[s] for both somatic and cognitive components of competitive A-trait" (p. 114). However, having said this, Martens et al. (1990, p.69) cite a study by Ostrow and Ziegler in which a principal components analysis produced a single-factor solution for the SCAT that supposedly confirmed the unidimensionality of the scale. Indeed, Martens et al. (1990) also contend that researchers have violated the psychometric properties of the SCAT (which were established during the scale's original validation: see Martens [1977] for a detailed description) by violating the "unidimensionality of the instrument" (p. 111). In other words, although they recognised that the SCAT is in need of modification to become more sensitive to the distinction between somatic and cognitive CTA, Martens et al. (1990) still advocate that the present version of the SCAT be treated as a unidimensional measure of CTA. Although this recommendation was followed in the present study, the identification of the four situational components of cognitive worry provides a starting point upon which future modifications to the SCAT may be developed.

Notwithstanding the four dimensions of cognitive-worry CTA that have been proposed in this study, the existence of other CTA dimensions cannot be ruled out. Indeed, MDS and factor analytic results regarding Item 14 (I worry about being ready or psyched up for the game) suggest the possibility of other dimensions. Item 14 was originally intended to measure athletes' worries about performance failure (see item content-relevance ratings in Table 3-3). However, the relative magnitude of the Euclidean distance separating Item 14 from the fear of failure item-cluster in Figure 3-5 indicates that the athletes, on average, did not perceive the "underlying reason for concern" described in Item 14 to be closely associated with the other fear of failure items. Perhaps the athletes perceived that Item 14 described concerns relating to a separate "psychological preparation" CTA dimension. Indeed, perceived readiness for competition was identified as a major theme that emerged from an inductive content analysis of competitive stressors conducted by James and Collins (1997). Moreover, a similar protocol conducted by Scanlan et al. (1991) also found that elite figure skaters cited worries about "preparedness or readiness to perform" (p. 107) as a salient source of competitive stress. Future research is required to examine the extent to which "perceived readiness" can be considered a legitimate (and separate) dimension of cognitive CTA.

Following an analysis of the congruence between situational threat perceptions and situational anxiety reactions among intercollegiate basketball players, Fisher and Zwart (1982) noted that in certain competitive situations, different athletes sometimes recognised the same threat but responded with different levels of anxiety. Fisher and Zwart (1982) described a hypothetical example of two basketball players receiving criticism from their coach following a crucial playing error; one athlete becomes anxious and withdrawn while the other player becomes more determined and motivated. This phenomenon may be explained on the basis of the differential hypothesis of the interaction model of anxiety (Endler, 1983; Flood & Endler, 1980). The differential hypothesis theorises that "differential changes in A-State for high and low A-Trait persons will occur only when the type of situational threat is congruent with the facet of A-Trait under consideration" (King & Endler, 1992, p. 85). For example, high and low injury/physical danger A-trait individuals would be expected to manifest different increases in A-state when confronted with a physical danger stressor, but not when confronted with a social evaluative stressor. Therefore, by applying the differential hypothesis to Fisher and Zwart's (1982) basketball example, researchers might hypothesise that the first athlete had a very high level of negative social evaluation A-trait, while the second athlete had a very low level of this A-trait dimension. However, without A-trait measures that are sensitive to the different situational threats inherent in competitive sport, the previous hypothesis cannot be tested. The point being emphasised is that the four cognitive CTA dimensions proposed in this study may give researchers a better opportunity to explain athletes' anxious responses to various situational threats in hockey. To this end, Vealey (1990) commented that a considerable amount of competitive A-trait research has been atheoretical in nature, and that future theory-driven research is required to provide researchers "with a conceptual basis for interpreting the [research] findings" (p. 252).

Although this study constitutes a purely trait-approach to the study of athlete-personality, the results do provide a starting point from which truly interactionist research can be conducted. In other words, with the construction of the four situational classes of CTA proposed in this study, future theory-driven interactionist research is possible whereby a priori hypotheses regarding "the simultaneous effect of different levels of person variables in particular types of [competitive] situations" can be tested (Endler & Parker, 1992, p. 188). The task for researchers will be to come up with innovative research designs that will permit the testing of these hypotheses in the competitive sport environment.

Finally, two limitations of this research must be acknowledged. Firstly, the CHWS is intended to provide a measure of cognitive CTA[3], but gives no measure of somatic CTA. Research has found a significant relationship between somatic A-state and performance in sport (e.g., Burton, 1988). Further, catastrophe theory (Hardy & Parfitt, 1991) also hypothesises that somatic A-state interacts with cognitive A-state to affect performance. Given these findings, the CHWS would need to be used in conjunction with other CTA instruments that measure the somatic aspects of anxiety if the CHWS was to be used most effectively for the purpose of investigating the anxiety-performance relationship in hockey.

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[3] It must be acknowledged that the CHWS has presently not been used to predict levels of competitive A-state among hockey players prior to competition. Consequently, more construct validity evidence relating to the CHWS is required before researchers can place more confidence in the inferences they make about cognitive CTA from the data provided by the scale.

Secondly, the extent to which the results obtained in the present study can be generalized to athletes competing in other sports is limited. Schwenkmezger and Laux (1986) alluded to this concern when discussing the problem of finding the "optimal degree of specificity" (p. 75) that competitive A-trait scales require for the purpose of predicting competitive A-state. Schwenkmezger and Laux (1986) stated, "If the situations described in the items or instructions [of an A-trait scale] are defined too broadly, the test may have reduced potential power; if too narrowly defined...the usefulness of the test may be limited only to these situations" (p. 75). The CHWS is intended to be a sport-specific measure of cognitive CTA consisting of many items that reflect hockey-specific stressors. However, despite the narrow focus of the CHWS with respect to hockey, it is hoped that the apparent multidimensional nature of the scale will stimulate future research aimed at assessing CTA from a multidimensional perspective; such research will hopefully lead to a greater understanding of the process surrounding competitive sport anxiety.

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# CHAPTER 4

## General Discussion

The results of the two studies comprising this dissertation have important implications for sport psychologists working in both research and applied settings. In particular, the two studies highlighted the need for caution when researchers and practitioners interpret results that are based upon aggregate-type data. Study 1 revealed that group-perception data (and the subsequent group-perception profile) may not adequately represent the perceptions of individual athletes in that individual differences in perception were lost when the data were analysed at the group level. Study 1 also showed how the "quality" of information derived from research can be greatly enhanced when both nomothetic (i.e., data aggregation) and idiographic methodologies are used together. When nomothetic and idiographic approaches are combined, the richness of the information obtained both at the group- and individual-levels can greatly enhance the researcher's understanding of the phenomenon being investigated.

Although in-depth idiographic analyses (in terms of interviews and extensive individual-level testing) were not used in conjunction with the predominantly nomothetic approach employed in the second study, the dangers of relying solely upon group-level results for inferential purposes were again illustrated. For example, the extreme groups MANOVAs conducted on high versus low competitive trait anxious (CTA) athletes (as measured by the Sport Competition Anxiety Test: SCAT), revealed that high CTA athletes had, on average, significantly higher pre-game worry tendencies regarding physical danger, performance failure, negative social evaluation, and situational uncertainties than low CTA athletes. However, the individual athlete-worry profile analyses conducted in Study 2 (see Table 3-19) clearly showed that these worry-tendency patterns were not characteristic of all high CTA athletes. In fact, the individual athlete-profile analyses showed a large degree of heterogeneity in the situational aspects of competition that athletes with identical CTA levels worried about (see Table 3-20). Therefore, the results of both studies highlight the importance of supplementing group-level assessments of anxiety and threat with individual-level analyses, particularly for the development of mental skills programs aimed at helping individual athletes cope with competitive anxiety. Although demanding more time and effort on the part of the sport psychologist, the most effective psychological skills programs can only be developed when they are targeted at the specific needs of each individual athlete, rather than at the needs of the "average athlete" whose very existence is questionable.

The second study (Chapter 3) was primarily designed to call into question the traditional conceptual framework that sport psychologists have generally used to examine cognitive aspects of competitive trait anxiety. In this regard, cognitive-CTA has generally been associated with athletes' concerns and worries about performance failure and negative social evaluation. However, the results of Study 2 demonstrate that worries about injury/physical danger and unknown situational circumstances also appear to be associated with CTA. Therefore, it seems reasonable to suggest that the scope (i.e., coverage) of CTA theory be extended to include fear of injury and fear of the unknown as legitimate cognitive-CTA dimensions. Extending the scope of any conceptual framework (or nomological network) has certain disadvantages because an increase in the number and/or complexity of components leads to a loss in parsimony within that conceptual domain (Brinberg & McGrath, 1985). However, "although much of what is considered progress in science comes about by the development of...theories that interpret a body of evidence more parsimoniously" than did previous conceptions (Brinberg & McGrath, 1985, p. 46), extending the limits of a theory is equally important if a greater understanding of a construct is to be obtained (Palys, 1992). Only by including fear of injury/physical danger and fear of the unknown as potential variables in future CTA research will their contribution to the understanding of competitive anxiety be known.

## Future Research Directions

The results of this dissertation raise a number of important questions (and issues) that require attention in future research if a better understanding of competitive sport anxiety is to be attained. One of the major recommendations put forward in Study 1 was for sport psychologists to supplement their nomothetic research methodologies with idiographic analyses. Although idiographic analyses were not employed in Study 2, individual athlete-interviews would have been extremely useful in answering the question, "do athletes differentiate between the fear of failure and the fear of negative social evaluation?".[1] In other words, the results from the multidimensional scaling analyses of the Similarity Rating Scale data (refer to Figures 3-5 and 3-6) showed that the items in the fear of failure cluster were separated from the items in the fear of negative social evaluation cluster. In contrast, results from the factor analyses of the Collegiate Hockey Worry Scale (CHWS) response data (refer to Tables 3-9 and 3-10) combined the fear of failure and fear of negative social evaluation items into a single factor. Had the participants been given the opportunity to interpret their own response profiles (as was the case in Study 1), the athletes could have been asked (through interview techniques) to describe whether they perceived a difference between the two constructs. It is quite possible, for example, that some athletes "worry about making mistakes" because they fear the negative social evaluation that may ensue as a result of making the mistake. On the other hand, it also seems possible that some athletes with the same propensity to "worry about making mistakes" focus solely upon their fear of not achieving their own personal performance goals. Idiographic level analyses (using interview techniques to provide "rich" qualitative data) would supplement the information currently gathered and deepen the researcher's understanding of the phenomena being investigated. It may even be suggested that future research in sport psychology should employ idiographic analyses as part of the construct validation process to ensure that the constructs being examined (or developed) are indeed meaningful and relevant at the individual level. Placing a major emphasis on idiographic analyses during the construct validation process would represent a move in the direction towards Windelband's original conception of "nomothetic research" where generalizations are established from the observation of regularities (among people) that appear across a series of $\underline{N} = 1$ studies (Lamiell, 1995).

Although the CHWS that was developed in Study 2 was designed to measure athletes' levels of cognitive CTA on four different situational A-trait dimensions, further research is required to provide more construct validity evidence for the scale. Presently, the CHWS has demonstrated no predictive power with respect to predicting athletes' levels of A-state prior to competition; idiographic investigations of the content of athletes' pre-competitive A-state worries would be valuable in helping address this limitation. For example, athletes' could be interviewed shortly after competition and probed about the content of their pre-game worries. If, over the course of a season, the content of athletes' pre-competitive situational A-state worries corresponded to their levels of reported CTA on the four CHWS dimensions, researchers could feel more confident that the CHWS was truly measuring the construct it purports to measure: namely, multidimensional cognitive CTA.

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[1] As discussed in Chapter 3, idiographic level analyses were not deemed feasible in Study 2 because time limitations precluded the opportunity for athletes to complete all 120 paired-similarity comparisons contained in the Similarity Rating Scale.

As mentioned in Chapter 3, the scope of the items included in the fear of injury/physical danger and fear of the unknown subscales of the CHWS is somewhat limited. For example, all of the fear of injury/physical danger items are related to the dangerous conduct of opponents; however, it is unknown whether the responses to the items on this subscale would have been affected if the content of the items had represented other potential aspects of the injury/physical danger construct (e.g., worry about getting hit by the puck). In other words, the "content representativeness" (Messick, 1989, p. 39) of the items contained in the CHWS subscales requires more attention.

With respect to all four of the CHWS A-trait dimensions proposed in Study 2, further research is required to determine the extent to which "previous experience" affects an athlete's predisposition to worry about each of the four situational CTA dimensions. For example, in Dunn and Nielsen's (1996) study of typical anxiety-inducing situations in team sports, one ice hockey player cited "Chasing the puck into the corner when pressured from behind" as one of the main situations that he found stressful. More importantly, the athlete qualified his response by stating that he feared this situation because he had previously broken his leg and suffered two serious knee injuries in similar situations.[2] Without further research, the extent to which past experiences (such as the one previously cited) contribute to athletes' tendency to worry about potential injury/physical danger prior to competition remains unknown. It is therefore recommended that future research be conducted to better understand why individuals become predisposed to experiencing various worries prior to competition on all four of the CTA dimensions proposed in Study 2.

In the future, researchers may wish to investigate the relationship between all four of the CTA dimensions proposed in Study 2 and drop-out rates among children who play competitive hockey. Although a considerable amount of research has been conducted to investigate the reasons why children drop out of sport (for a review see Weiss & Petlichkoff, 1989) no research has focussed specifically upon the relationship between competitive trait anxiety and sport attrition. It may also be worthwhile for researchers to investigate the extent to which the four CTA dimensions developed in Study 2 exist in other sports. For example, unpublished data from Dunn and Nielsen's (1996) study of anxiety-inducing situations in four team sports contained the responses of one male soccer player who cited three potentially injurious situations that occur during soccer games as antecedents of anxiety. It may be hypothesised that this athlete has a high level of injury/physical danger CTA, since it appears that the athlete is predisposed to perceiving potentially injurious situations as threatening; however, without further research, this hypothesis will remain unsubstantiated.

In closing, it is important to acknowledge that this dissertation did not ask athletes to comment upon whether they felt that their pre-competitive worries helped or hindered their psychological preparation for competition. A number of studies (e.g., Jones & Swain, 1992, 1995; Jones, Hanton, & Swain, 1994) have found that individual differences exist with respect to athletes' perceptions of the facilitative versus debilitative nature of anxiety experiences. For example, Jones and Swain (1992) found that men's intramural team-sport participants who were classified into high- and low-competitive groups (on the basis of their scores on the competitive-dimension of Gill and Deeter's [1988] Sport Anxiety Questionnaire), differed significantly with respect to the way they perceived their anxiety. Although not differing in terms of their actual A-state levels, the high-competitive group perceived their anxiety responses as being significantly more facilitative and significantly less debilitative to performance than the low-competitive group. Further, Jones et al. (1994) reported that elite competitive swimmers, on average, perceived their A-state levels to be significantly more facilitative to performance than non-elite competitive swimmers. Similar results were obtained by Jones and Swain (1995) when they compared the perceptions of elite and non-elite male cricket players towards the facilitative nature of competitive A-trait levels.

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[2] This specific data was not published in Dunn and Nielsen (1996) but is available from the principle author upon request.

The facilitative versus debilitative line of research adopted by Jones (1995) and his colleagues may have important implications for understanding the cognitive components of athletes' CTA established in Study 2. For example, considerable discussion was given to the "lack of fit" between Item 14 (I worry about not being ready or psyched up for the game) and the four cognitive CTA dimensions developed in the second study. This lack of fit may have resulted because Item 14 was viewed as a positive or facilitative pre-game worry which possibly functioned as a self-regulatory strategy that the athletes used to check, and subsequently alter, their state of psychological readiness in order to achieve their ideal performance state for competition. However, Jones' (1995) approach to assessing the perceived facilitative versus debilitative nature of anxiety is required if such a proposition is to be validated. Clearly, a great deal of research is still required if a more complete understanding of the competitive anxiety process is to be attained.

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# APPENDICES

# Appendix A

## Demographic Questionnaire

**Please provide the following background information.**

1. Date of Birth: Day (______), Month (______), Year(______).

2. Which collegiate/university hockey team do you currently play with?

________________________________________.

3. How old were you when you first started competing in organised hockey?

Years (______).

4. How many years have you competed at the collegiate/university level in hockey? (*Circle the appropriate response.*)

This is my: 1st year 2nd year 3rd year 4th year 5th year

5. How many years have you played for **this** team? (*Circle the appropriate response.*)

This is my: 1st year 2nd year 3rd year 4th year 5th year

6. What is your **regular** playing position with this team? (*Circle the appropriate response.*)

goaltender............defenseman............centre............winger

7. What do you see as being your **main** personal playing strengths? (e.g., scoring, checking, leadership, etc: *list as many as you want.*)

________________________________________________

________________________________________________

8. What do you see as being your **main** personal playing weaknesses? (e.g., scoring, checking, leadership, etc: *list as many as you want.*)

________________________________________________

________________________________________________

9. Briefly outline the major role you see yourself playing for this team?

________________________________________________

________________________________________________

## Appendix B

## Sport Competition Anxiety Test

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# ILLINOIS COMPETITION QUESTIONNAIRE

Below are some statements about how athletes feel when they compete. Read each statement and decide if you HARDLY EVER, SOMETIMES, or OFTEN feel this way when you compete in hockey. If your choice is HARDLY EVER, circle "A", if your choice is SOMETIMES, circle "B", and if your choice is OFTEN, circle "C". There are no right or wrong answers. Do not spend too much time on any one statement. *Remember* to choose the word that describes how you *usually* feel when you compete.

| | | Hardly Ever | Sometimes | Often |
|---|---|---|---|---|
| 1. | Competing against others is socially enjoyable. | A | B | C |
| 2. | Before I compete I feel uneasy. | A | B | C |
| 3. | Before I compete I worry about not performing well. | A | B | C |
| 4. | I am a "good sport" when I compete. | A | B | C |
| 5. | When I compete, I worry about making mistakes. | A | B | C |
| 6. | Before I compete I am calm. | A | B | C |
| 7. | Setting a goal is important when competing. | A | B | C |
| 8. | Before I compete I get a queasy feeling in my stomach. | A | B | C |
| 9. | Just before competing I notice that my heart beats faster than usual. | A | B | C |
| 10. | I like to compete in games that demand considerable physical energy. | A | B | C |
| 11. | Before I compete I feel relaxed. | A | B | C |
| 12. | Before I compete I am nervous. | A | B | C |
| 13. | Team sports are more exciting than individual sports. | A | B | C |
| 14. | I get nervous wanting to start the game. | A | B | C |
| 15. | Before I compete I usually get uptight. | A | B | C |

---

# Appendix C

## Sport Anxiety Scale

### WASHINGTON SPORT REACTION SCALE

A number of statements that athletes have used to describe their thoughts and feelings **before or during competition** are listed on the following page. Read each statement and then circle the appropriate response to the right of the statement to indicate how you **generally feel** prior to or during competition. There are no right or wrong answers. Do not spend too much time on any one statement, but choose the answer that best describes how you commonly react.

| ***How do you generally feel prior to or during competition?*** | Not at all | Somewhat | Moderately so | Very much so |
|---|---|---|---|---|
| 1) I feel nervous. | 1 | 2 | 3 | 4 |
| 2) During competition, I find myself thinking about unrelated things. | 1 | 2 | 3 | 4 |
| 3) I have self-doubts. | 1 | 2 | 3 | 4 |
| 4) My body feels tense. | 1 | 2 | 3 | 4 |
| 5) I am concerned that I may not do as well in competition as I could. | 1 | 2 | 3 | 4 |
| 6) My mind wanders during competition. | 1 | 2 | 3 | 4 |
| 7) While performing, I often do not pay attention to what's going on. | 1 | 2 | 3 | 4 |
| 8) I feel tense in my stomach. | 1 | 2 | 3 | 4 |
| 9) Thoughts of doing poorly interfere with my concentration during competition. | 1 | 2 | 3 | 4 |
| 10) I'm concerned about choking under pressure. | 1 | 2 | 3 | 4 |
| 11) My heart races. | 1 | 2 | 3 | 4 |
| 12) I feel my stomach sinking. | 1 | 2 | 3 | 4 |
| 13) I'm concerned about performing poorly. | 1 | 2 | 3 | 4 |
| 14) I have lapses of concentration because of nervousness. | 1 | 2 | 3 | 4 |
| 15) I sometimes find myself trembling before or during a competitive event. | 1 | 2 | 3 | 4 |
| 16) I'm worried about reaching my goal. | 1 | 2 | 3 | 4 |
| 17) My body feels tight. | 1 | 2 | 3 | 4 |
| 18) I'm concerned that others will be disappointed in my performance. | 1 | 2 | 3 | 4 |
| 19) My stomach gets upset before or during competition. | 1 | 2 | 3 | 4 |
| 20) I'm concerned I won't be able to concentrate. | 1 | 2 | 3 | 4 |
| 21) My heart pounds before a game. | 1 | 2 | 3 | 4 |

## Appendix D

## Collegiate Hockey Worry Scale

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The purpose of this questionnaire is to identify the main aspects of competition that cause hockey players to feel anxious before they compete. In particular, we would like to know the types of things that players worry about before games. To complete the questionnaire, please read each statement then indicate the extent to which each statement reflects **a typical source of pre-game worry/concern** for you. In other words, ***indicate the degree to which each concern characterises the way you generally feel or think before competition.***

---

| ***Before competition I have a tendency to...*** | Not at all like me | | Somewhat like me | | Very much like me |
|---|---|---|---|---|---|
| 1. ...worry about the opposition playing chippy physical hockey. | 1 | 2 | 3 | 4 | 5 |
| 2. …worry about what my teammates will think if I let them down. | 1 | 2 | 3 | 4 | 5 |
| 3. …worry about making mistakes. | 1 | 2 | 3 | 4 | 5 |
| 4. …worry about other people being disappointed with me. | 1 | 2 | 3 | 4 | 5 |
| 5. …worry about not knowing the characteristics of the players I'll be up against. | 1 | 2 | 3 | 4 | 5 |
| 6. …worry about opponents getting "out of control" in physical bad-tempered games. | 1 | 2 | 3 | 4 | 5 |
| 7. …worry about how the coach will view my performance. | 1 | 2 | 3 | 4 | 5 |
| 8. …worry about playing poorly. | 1 | 2 | 3 | 4 | 5 |
| 9. …worry about what to expect from teams I know little about. | 1 | 2 | 3 | 4 | 5 |
| 10. …worry about the opposition playing dirty physical hockey. | 1 | 2 | 3 | 4 | 5 |
| 11. …worry because I don't feel that I know how the opposition will play. | 1 | 2 | 3 | 4 | 5 |
| 12. …worry about opponents who are known for their dirty stick-work. | 1 | 2 | 3 | 4 | 5 |
| 13. …worry about spectators or friends forming a poor impression of me. | 1 | 2 | 3 | 4 | 5 |
| 14. …worry about not being ready or "psyched-up" enough to play my best. | 1 | 2 | 3 | 4 | 5 |
| 15. …worry because I don't know what to expect in the game. | 1 | 2 | 3 | 4 | 5 |
| 16. …worry about not performing up to the best of my ability. | 1 | 2 | 3 | 4 | 5 |

# Appendix E

## Similarity Rating Scale

People often report having different types of worries when they are confronted with a certain situation. Consider the following two statements that describe two **different types of worries** people have experienced just prior to making a bungy jump.

*"I worried about what my friends might say if I decided to back down."*
versus
*"I worried about the possibility of the cord snapping."*

As you can see, the **underlying reason for concern** in each statement is quite different. The first describes concern about embarrassment, while the second statement describes concern about possible physical danger. If you were asked to rate the similarity of the two statements according to the "underlying reasons for concern," you would probably rate these statements as "**not at all similar**."

However, consider the following example in which the second statement has been changed.

*"I worried about what my friends might say if I decided to back down."*
versus
*"I worried about the teasing I would get if I decided not to jump."*

In this example, you would probably have rated the underlying reasons for concern as being "**very similar**."

The following pages contain pairs of statements that describe the types of worries and concerns that collegiate-level hockey players have reported experiencing shortly before and during competition. Using the scale below, please rate the similarity of the "**underlying reasons for concern**" in each pair of statements. The scale ranges from zero (*very similar*) to eight (*not at all similar*).

| Very Similar | | | | | | | | Not at all Similar |
|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

To familiarize yourself with all of the statements, please read the list on the following page before you start to make your similarity ratings.

## Appendix E (Continued)

**Please read the list of items carefully to get an idea of the "*major underlying reason for concern*" in each statement.**

1) I worry about the opposition playing chippy physical hockey.

2) I worry about what my teammates will think if I let them down.

3) I worry about making mistakes.

4) I worry about other people being disappointed with me.

5) I worry about not knowing the characteristics of the players I'll be up against.

6) I worry about opponents getting "out of control" in physical bad-tempered games.

7) I worry about how the coach will view my performance.

8) I worry about playing poorly.

9) I worry about what to expect from teams I know little about.

10) I worry about the opposition playing dirty physical hockey.

11) I worry because I don't know how the opposition will play.

12) I worry about opponents who are known for their dirty stick-work.

13) I worry about spectators or friends forming a poor impression of me.

14) I worry about not being ready or "psyched-up" enough to play my best.

15) I worry because I don't know what to expect in the game.

16) I worry about not performing up to the best of my ability.

## Appendix E (Continued)

**Remember to base your similarity ratings on the "*major underlying reason for concern*" that you feel is apparent in each statement. Circle the number that reflects the degree of similarity in each pair.**

[1] I worry about the opposition playing chippy physical hockey.
vs.
I worry about what my teammates will think if I let them down.

| Very Similar | | | | | | | | Not at all Similar |
|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

[2] I worry about not performing up to the best of my ability.
vs.
I worry about other people being disappointed with me.

| Very Similar | | | | | | | | Not at all Similar |
|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

[3] I worry because I don't know what to expect in the game.
vs.
I worry about not knowing the characteristics of the players I'll be up against.

| Very Similar | | | | | | | | Not at all Similar |
|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

[4] I worry about not being ready or "psyched-up" enough to play my best.
vs.
I worry about opponents getting "out of control" in physical bad-tempered games.

| Very Similar | | | | | | | | Not at all Similar |
|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

# Appendix F

## Formula to Calculate Effect Size for Dependent Means (Cohen, 1977)

$$\boxed{d_z{}' = \frac{m_z}{\alpha_z}}$$

Where: $d_z{}'$ = Effect size index for dependent means

$m_z = \text{Mean}_X - \text{Mean}_Y$

$$\alpha_Z = \alpha_{X-Y} = \sqrt{\alpha_X{}^2 + \alpha_Y{}^2 - 2r\alpha_X\alpha_Y}$$

Where: $\alpha_X{}^2$ = Variance of variable X

$\alpha_Y{}^2$ = Variance of variable Y

$r\alpha_X\alpha_Y$ = Covariance $_{XY}$

# Appendix G

## Pattern Coefficients From a Principal Components Analysis (Direct Oblimin Transformation: Delta = 0) of the Sport Anxiety Scale

| Item | Abbreviated item description | Pattern Coefficients | | |
|---|---|---|---|---|
| | | I | II | III |
| 1. | I feel nervous. | **.67** | .15 | -.14 |
| 2. | Think about unrelated things. | -.04 | .07 | **.90** |
| 3. | I have self-doubts. | .08 | **.56** | .29 |
| 4. | My body feels tense. | **.62** | .10 | .06 |
| 5. | Concerned about doing well. | .01 | **.70** | .00 |
| 6. | My mind wanders. | .00 | -.06 | **.91** |
| 7. | Don't pay attention. | -.05 | .17 | **.46** |
| 8. | Feel tense in my stomach. | **.82** | -.13 | -.03 |
| 9. | Thoughts interfere with my concentration. | -.01 | **.74** | .02 |
| 10. | Concerned about choking. | .01 | **.74** | .01 |
| 11. | My heart races. | **.68** | .17 | -.16 |
| 12. | Feel my stomach sinking. | **.77** | -.01 | .08 |
| 13. | Concerned about performing poorly. | -.04 | **.80** | -.02 |
| 14. | Have lapses of concentration due to nerves. | .16 | **.53** | .03 |
| 15. | Find myself trembling before competition. | **.53** | .13 | .03 |
| 16. | Worry about reaching my goal. | -.03 | **.60** | -.11 |
| 17. | My body feels tight. | **.75** | -.04 | .07 |
| 18. | Concerned that others will be disappointed. | -.02 | **.73** | -.03 |
| 19. | My stomach gets upset. | **.78** | -.15 | .07 |
| 20. | Concerned about concentrating. | .08 | **.50** | .31 |
| 21. | My heart pounds before a game. | **.69** | .01 | -.21 |

Note. I = Somatic Anxiety; II = Cognitive Worry; III = Concentration Disruption. Interfactor correlations: $\underline{r}_{\mathrm{I,II}} = .31$; $\underline{r}_{\mathrm{I,III}} = -.09$; $\underline{r}_{\mathrm{II,III}} = .22$

# Appendix H

Correlations (r) Between the Somatic and Cognitive Subscales of the Sport Competition Anxiety Test (SCAT), Sport Anxiety Scale (SAS) Subscales, and Collegiate Hockey Worry Scale (CHWS) Subscales

| | SCAT Cognitive | SAS Somatic | SAS Worry | SAS Con. Dis. | CHWS Injury [c] | CHWS Unknown [c] | CHWS Failure [c] | CHWS Evaluation [c] | CHWS Eval/Fail [d] |
|---|---|---|---|---|---|---|---|---|---|
| SCAT-Somatic [a] | .33**** | .78**** | .26*** | -.17* | .14 $^{n.s}$ | .18* | .30**** | .18* | .25*** |
| SCAT-Cognitive [b] | - | .33**** | .72**** | .12 $^{n.s}$ | .15* | .18* | .60**** | .52**** | .60**** |
| Mean Score | 4.56 | 16.60 | | | | | | | |
| Standard Deviation | 1.13 | 4.07 | | | | | | | |

Note. SCAT subscales are based on the results of a principal components analysis that was conducted on the SCAT data in this study.

[a] SCAT-Somatic subscale contains eight items. [b] SCAT-Cognitive subscale contains two items. [c] CHWS subscales are based on item-clusters derived from the multidimensional scaling analysis of the SRS data. [d] CHWS Eval/Fail subscale is based on the factor analytic solution of the CHWS response data and is a composite of the CHWS Evaluation and CHWS Failure dimensions.

*$p < .05$. **$p < .01$. ***$p < .005$. ****$p < .001$ $^{n.s}$ Non-significant

## Appendix I

Summary Statistics for Multivariate and Univariate Planned Comparisons Between High and Low SCAT Scorers on Three Collegiate Hockey Worry Scale (CHWS) Dimensions

| CHWS | Competitive A-Trait Grouping | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | High SCAT [a] | | Low SCAT [b] | | Multivariate Statistics | | Univariate Statistics | | |
| Dimensions | M | (SD) | M | (SD) | $T^2$ | F (3,110) | F (1,112) | Effect Size [c] | Power |
| | | | | | .265 | 9.72*** | | | |
| Injury | 9.09 | (3.91) | 7.21 | (3.09) | | | 8.08** | .53 | .80 |
| Unknown | 9.21 | (3.54) | 7.40 | (2.90) | | | 8.90** | .56 | .84 |
| Eval/Fail | 26.00 | (5.59) | 21.12 | (5.74) | | | 21.13*** | .86 | 1.00 |

Note. CHWS dimensions are based on item-clusters derived from factor analytic solution.

[a] Highest 32% of SCAT scorers ($n = 57$). [b] Lowest 32% of SCAT scorers ($n = 57$). [c] Effect Size = $[(M_{High} - M_{Low})/SD_{pooled}]$.

**$p < .01$. ***$p < .001$.

## Appendix J

Summary Statistics for Multivariate and Univariate Planned Comparisons Between High and Low SAS Somatic A-Trait Subscale Scorers on Three Collegiate Hockey Worry Scale (CHWS) Dimensions

| | Competitive A-Trait Grouping | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CHWS | High Somatic[a] | | Low Somatic[b] | | Multivariate Statistics | | Univariate Statistics | | |
| Dimensions | M | (SD) | M | (SD) | $T^2$ | F (3,116) | F (1,118) | Effect Size[c] | Power |
| | | | | | .136 | 5.24** | | | |
| Injury | 8.90 | (3.88) | 7.52 | (3.01) | | | 4.76* | .40 | .58 |
| Unknown | 9.25 | (3.48) | 7.37 | (3.00) | | | 10.08** | .58 | .88 |
| Eval/Fail | 25.13 | (5.38) | 22.27 | (5.90) | | | 7.74** | .51 | .79 |

Note. CHWS dimensions are based on item-clusters derived from factor analytic solution.

[a] Highest 33.7% of SAS-Somatic scorers ($n = 60$). [b] Lowest 33.7% of SAS-Somatic scorers ($n = 60$). [c] Effect Size = $[(M_{High} - M_{Low}) / SD_{pooled}]$.

*$p < .05$. **$p < .01$.

# Appendix K

Summary Statistics for Multivariate and Univariate Planned Comparisons Between High and Low SAS Cognitive Worry A-Trait Subscale Scorers on Three Collegiate Hockey Worry Scale (CHWS) Dimensions

| CHWS | Competitive A-Trait Grouping | | | | Multivariate Statistics | | Univariate Statistics | | |
|---|---|---|---|---|---|---|---|---|---|
| | High Worry $^a$ | | Low Worry $^b$ | | | | | | |
| Dimensions | M | (SD) | M | (SD) | $T^2$ | F (3,110) | F (1,112) | Effect Size $^c$ | Power |
| | | | | | .992 | 36.39*** | | | |
| Injury | 8.98 | (3.57) | 7.14 | (2.92) | | | 9.07** | .56 | .85 |
| Unknown | 8.98 | (3.22) | 7.42 | (2.95) | | | 7.29** | .50 | .76 |
| Eval/Fail | 28.61 | (4.17) | 19.56 | (5.27) | | | 103.49*** | 1.91 | 1.00 |

Note. CHWS dimensions are based on item-clusters derived from factor analytic solution.

$^a$ Highest 32% of SAS-Worry subscale scorers ($n = 57$). $^b$ Lowest 32% of SAS-Worry subscale scorers ($n = 57$). $^c$ Effect Size = $[(M_{High} - M_{Low})/SD_{pooled}]$.

** < .01. ***$p < .001$.

# Appendix L

## Summary Statistics for Multivariate and Univariate Planned Comparisons Between High and Low SAS Concentration Disruption (CD) A-Trait Subscale Scorers on Three Collegiate Hockey Worry Scale (CHWS) Dimensions

| | Competitive A-Trait Grouping | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CHWS | High CD [a] | | Low CD [b] | | Multivariate Statistics | | Univariate Statistics | | |
| Dimensions | M | (SD) | M | (SD) | $T^2$ | F (3,100) | F (1,102) | Effect Size [c] | Power |
| | | | | | .10 | 3.22* | | | |
| Injury | 8.81 | (4.08) | 6.81 | (2.57) | | | 8.96** | .59 | .84 |
| Unknown | 8.54 | (3.58) | 7.79 | (2.82) | | | $1.41^{n.s.}$ | .23 | .21 |
| Eval/Fail | 25.12 | (6.22) | 23.88 | (5.98) | | | $1.06^{n.s.}$ | .20 | .18 |

Note. CHWS dimensions are based on item-clusters derived from factor analytic solution.

[a] Highest 29.2% of SAS-Concentration Disruption subscale scorers ($n = 52$). [b] Lowest 29.2% of SAS-Concentration Disruption subscale scorers ($n = 52$). [c] Effect Size = $[(M_{High} - M_{Low})/SD_{pooled}]$.

*$p \leq .05$. **$p < .01$. $^{n.s.}$ Non-significant.

# Appendix M

## SPSS Output of Agglomeration Schedule from Hierarchical Cluster Analysis of Athletes Scoring 26 to 30 on the Sport Competition Anxiety Test

```
Agglomeration Schedule using Average Linkage (Between Groups)

           Clusters  Combined                  Stage Cluster 1st Appears    Next
Stage     Cluster 1  Cluster 2    Coefficient    Cluster 1  Cluster 2      Stage

   1          18         21        1.000000          0          0            2
   2          10         18        3.500000          0          1            7
   3          25         27        5.000000          0          0           15
   4           6          7        5.000000          0          0           18
   5          26         29        6.000000          0          0            6
   6           3         26        7.000000          0          5           10
   7          10         22        7.333333          2          0           11
   8           9         11        8.000000          0          0           12
   9           2         28        9.000000          0          0           17
  10           3          8       12.666667          6          0           12
  11          10         23       13.500000          7          0           17
  12           3          9       13.500000         10          8           19
  13          17         30       15.000000          0          0           18
  14          13         24       15.000000          0          0           23
  15           5         25       15.500000          0          3           23
  16          14         20       17.000000          0          0           25
  17           2         10       19.299999          9         11           19
  18           6         17       21.500000          4         13           20
  19           2          3       23.952381         17         12           20
  20           2          6       33.230770         19         18           25
  21          15         16       35.000000          0          0           26
  22           1          4       40.000000          0          0           24
  23           5         13       52.166668         15         14           26
  24           1         12       53.000000         22          0           27
  25           2         14       59.676472         20         16           28
  26           5         15       64.500000         23         21           28
  27           1         19      105.333336         24          0           29
  28           2          5      115.909775         25         26           29
  29           1          2      150.403839         27         28            0
```